101

Syllabus

NEW DIMENSIONS IN EDUCATION TECHNOLOGY

JANUARY 2002 • VOLUME 15, NO. 6

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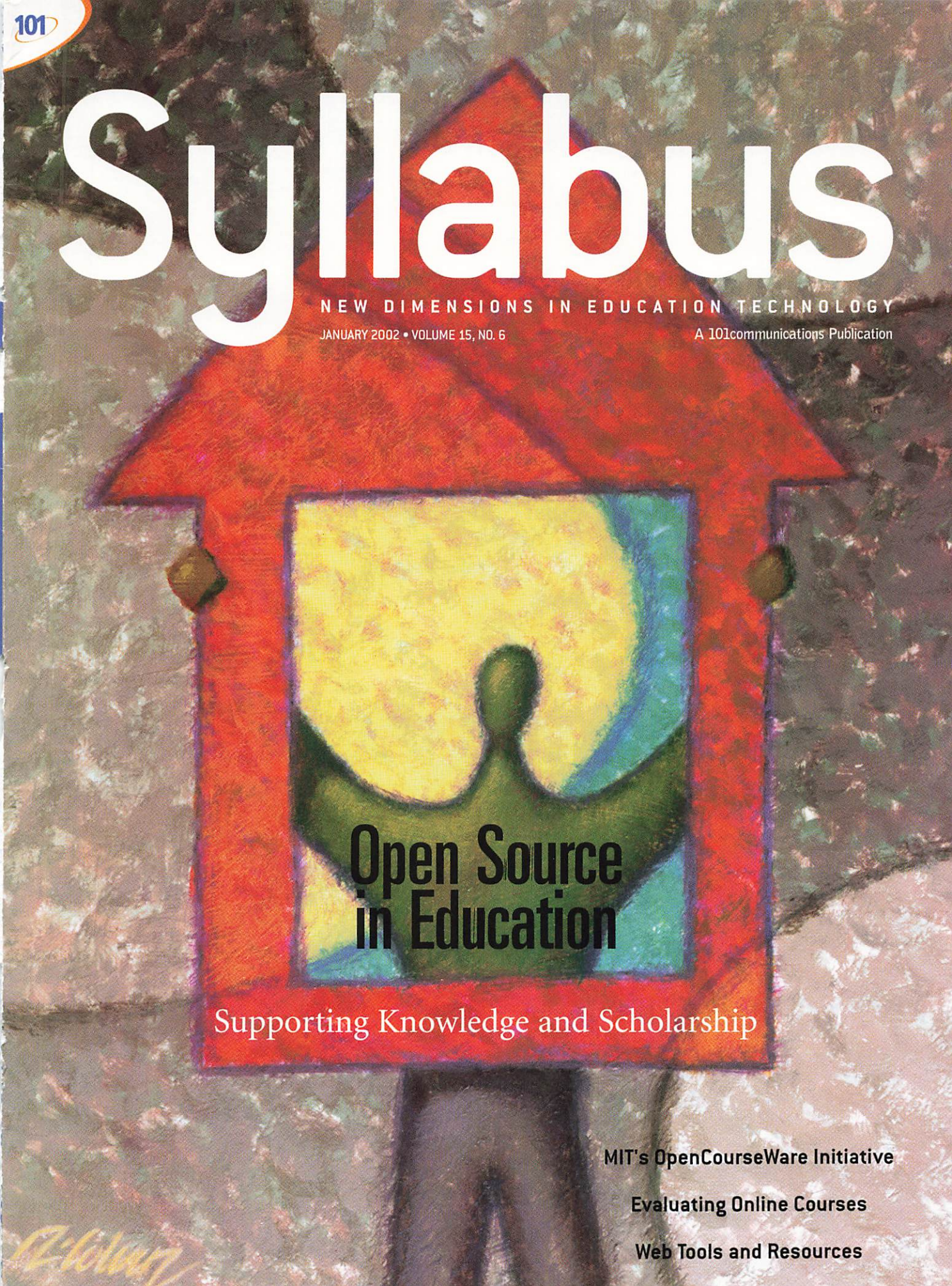

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EDITOR'S NOTE

Mary Grush, Editor

One of the most interesting things happening in higher education IT is a quiet but potentially revolutionary movement toward open source. Given the success of open source software, modeled by Linux, the wider application of open source principles to knowledge creation, scholarship, and educational resources seems worthwhile. This past July, MIT announced its commitment to putting the materials for virtually all of its 2,000-plus courses online for public use. In our lead feature article, "OpenCourseWare: Simple Idea, Profound Implications" (page 12), Phil Long presents MIT's OCW project and takes a look at some of its implications—which may indeed be a bit more profound than even he allows in this brief introduction.

Open source practices will generate learning objects in common formats that can be easily shared and quickly developed through the work of multiple contributors. Although course materials and various learning objects may not be *courses* in themselves, their availability will promote the development of greater numbers of online course offerings. In such an environment, the need for evaluation tools will increase. In his article, "A New Methodology for Evaluation: The Pedagogical Rating of Online Courses" (page 18), MIT's Nishikant Sonwalkar proposes a new rating system for online courses. Sonwalkar's work will be among the many contributions needed to approach the enormous problem of evaluation.

Collaboration on the development and extension of course materials to multiple uses and even to diverse educational communities will be hallmarks of open source in education. In their article, "Collaborating to Create Narrative Case Studies" (page 26), three educators from Seton Hall University describe their collaborative efforts to create narrative case studies that extend across course boundaries to serve a curriculum in occupational therapy at SHU.

Given the vast amounts of course materials and learning objects that may ultimately be online as open source, what common platforms should be developed to manage content assets and provide access? The colleges and universities collaborating on the Open Knowledge Initiative (web.mit.edu/oki) seek to produce an open source learning system infrastructure, which will lead to the development of sharable tools to create and manage educational content. Can open source and commercial efforts coexist? Taking a lesson from the open source software movement, one can see that there should be plenty of room for both commercial and open source development. And ideally, open source in education will support the knowledge and scholarship that will help advance high standards in both commercial and non-commercial domains.

Mark your calendar for Syllabus2002, our ninth annual summer conference, returning to the Santa Clara Convention Center July 27-31. See page 15 for preliminary conference information, and visit www.syllabus.com for updates.

Enjoy this issue of *Syllabus!*

Mary Grush

Letters to the editor should be addressed to the editor and sent to 101 First Street, #605, Los Altos, CA 94022, or via electronic mail. We reserve the right to edit all submissions. **News and product information** will be considered for publication. Please send all materials to Paul McCloskey. If you are interested in writing for *Syllabus*, please send a brief description of your article idea along with writing samples to the editor at the above address.

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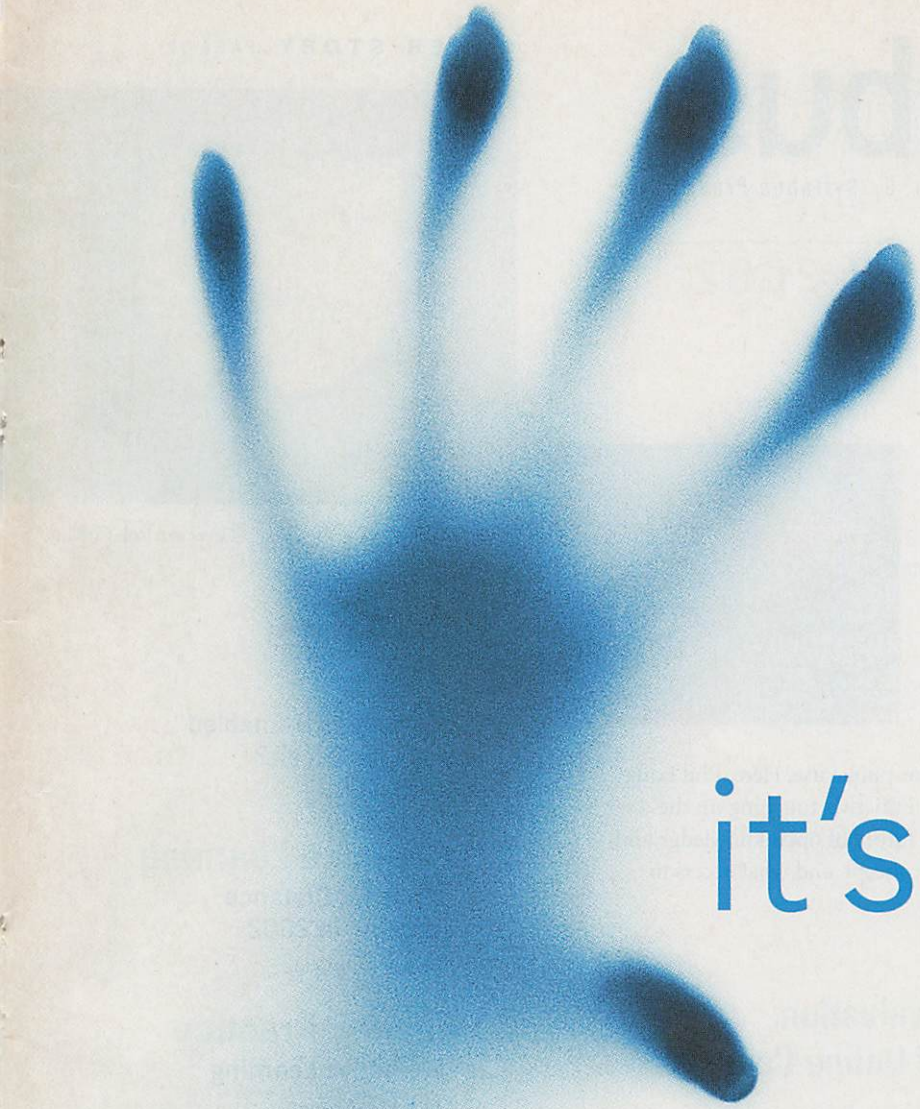

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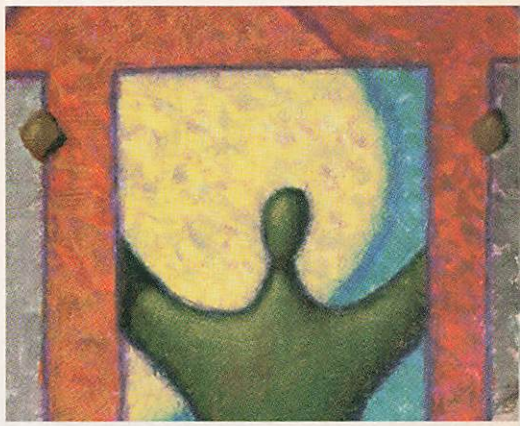

Cover art: Rob Colvin

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Phillip D. Long

While many institutions have made selected course materials available online, MIT has committed to a long-range plan to put materials for more than 2,000 undergraduate and graduate courses up for public use. Here, Phil Long tells the story of MIT's OpenCourseWare initiative, touching on the practical problems, the implications for a future of open knowledge and scholarship modeled on the open source concept, and what access to OCW is *not*—an MIT education.

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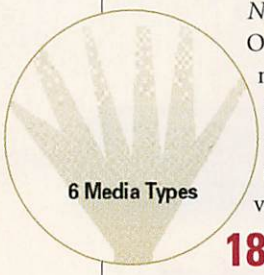
18 **A New Methodology for Evaluation: The Pedagogical Rating of Online Courses**

Nishikant Sonwalkar

Online courses should be evaluated not merely for their online materials, but for the sum total of elements contributing to their success. In this article, Nish Sonwalkar proposes an evaluation tool to provide an overall measure of the effectiveness of an online course—with consideration given to the inclusion of various learning styles, media types, and interactive elements.



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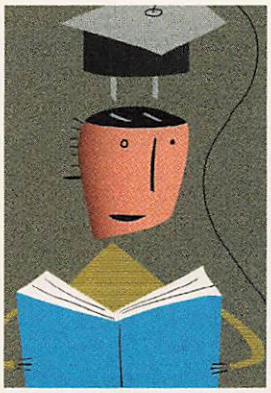
26 **Collaborating to Create Narrative Case Studies**

Elizabeth M. Torcivia, Meryl M. Picard, and Paul Younghouse

A more open environment for sharing course materials may influence collaborative development efforts and the extension of materials to multiple uses. Three contributors describe a collaborative process to develop narrative case studies for the occupational therapy curriculum at Seton Hall University.



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Phillip D. Long

Phillip D. Long is senior strategist for the Academic Computing Enterprise at MIT. He is also a senior associate for the TLT Group of the American Association for Higher Education. longpd@mit.edu

TRENDS

AN INFORMATION RESOURCE OF INTEREST TO EDUCATORS

Briefs

■ SAP America Inc., an enterprise software developer, started a program to fund **university e-business** research projects. The company is currently committing more than $500,000 to fund and participate in three projects at Rutgers and the Rochester Institute of Technology.

■ College store operator Follett Higher Education Group said it would start offering study guides and other course material in **Adobe Systems Inc.'s Acrobat** and **Microsoft Corp.'s Reader** formats.

■ The University of Maryland is collaborating with state law enforcement officials to set up a wireless messaging system to help **homeland security** officials quickly access criminal justice databases. The pilot project is using wireless technology from Aether Sytems Inc.

For these and other news stories, or to subscribe to the weekly Syllabus e-News, Resources, and Trends, visit www.syllabus.com.

Plagiarism: IT-Enabled Tools for Deceit?

The other day, a call came in to a faculty support team from an instructor with what has become an increasing concern: a paper submitted for a class assignment didn't seem representative of the student's prior work. Red flags were raised. Was this a case of plagiarism? How could the professor check?

Faculty fear of plagiarism is, sadly, legitimate. Web sites continue to proliferate offering term papers, short essays, and reports of one sort or another at anywhere from $7 to $30 per page. Their increasing availability certainly suggests there is a market.

While we condemn submitting the words of others in place of one's own, we fail to look at why this happens. The answer is not so simple. Some of the transgressions collected under the plagiarism banner include failure to attribute the source of an extensive quotation, not formally recognizing the originator of an idea, using phrases of others without indicating so with quotation marks, and, of course, wholesale downloading of term papers. Some transgressions are omissions, others a failure to understand the ethics of copyright.

Term Papers on the Web

Academic Term Papers
www.academictermpapers.com

Thousands of Papers
www.termpapers-on-file.com

RealPapers.com
www.realpapers.com

PinkMonkey.com
www.pinkmonkey.com

No faculty member should tolerate a downloaded paper. There are software tools that can help. Send the text of a student's paper to one of a number of services that will search the Internet for matches. A handful are free, but the majority, like the paper sites, are commercial ventures, and their effectiveness varies. Depending on the sophistication of the comparison tool, subscription paper sites may be inaccessible. But they assuage some faculty anxiety and catch those students whose laziness extends not just to writing the paper but to the method of procuring it.

How do they work? Most rely on statistically based vocabulary cross-checking and comparison of structural recurrences in text passages. For example, www.turnitin.com uses a plagiarism-checking algorithm that appears to rely on word similarity or identity. This assumes that most students will not bother to make wholesale lexical or structural changes to the material they copy.

Other services develop a digital "fingerprint" that is used to search across a wider swath of

continued on page 11

Selected Anti-Plagiarism Sites

Plagiarism.org
Self-described "online resource for educators concerned with the growing problem of Internet plagiarism."
www.plagiarism.org and www.turnitin.com

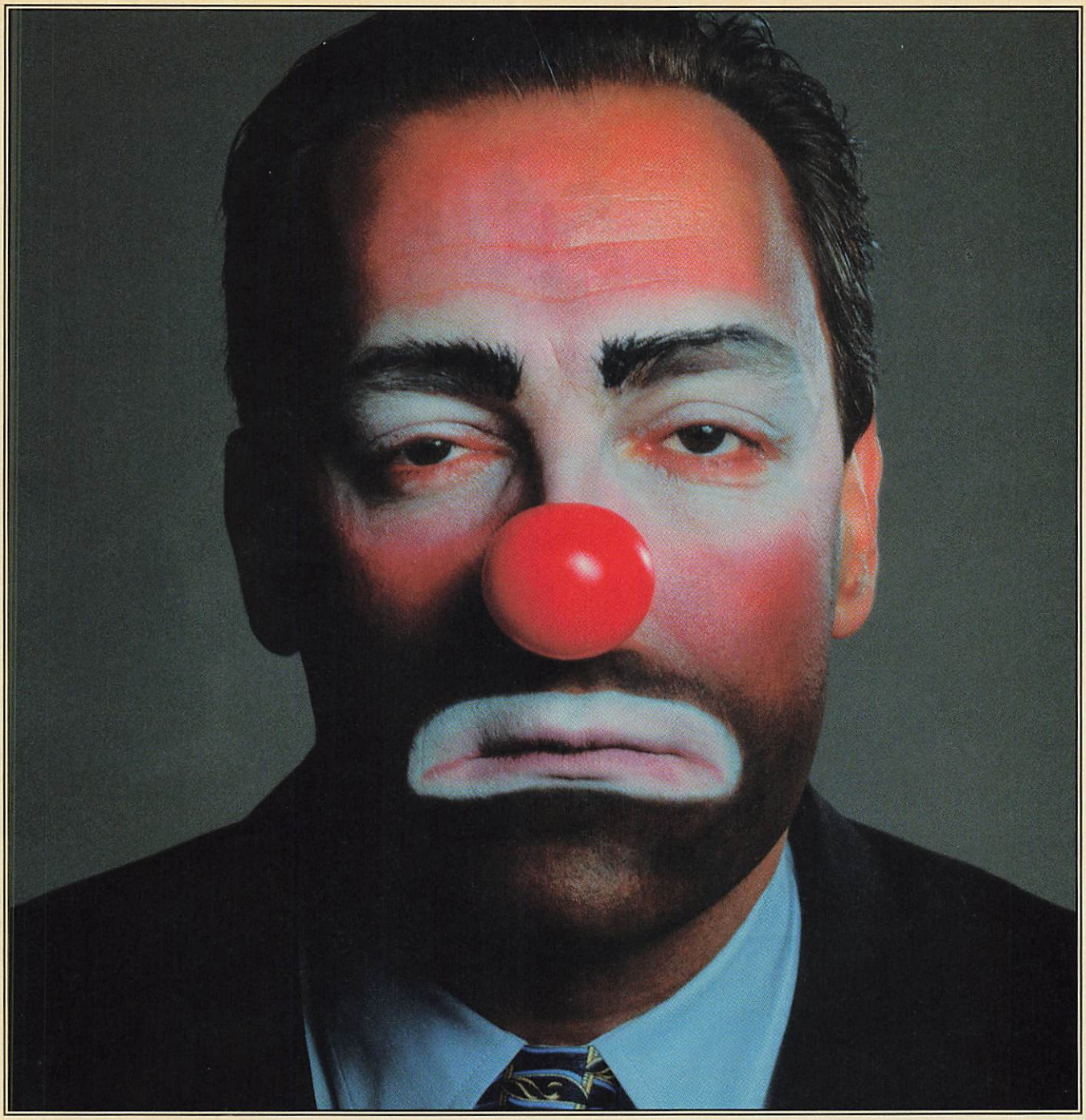
Plagiarized.com
"The Instructors Guide to Internet Plagiarism."
www.plagiarized.com

PaperBin.com
A commercial service that checks student papers against its paper database. It bills itself as a plagiarism-prevention service.
www.paperbin.com

HowOriginal.com
A free service that checks a 1K chunk of text against Internet resources for plagiarism. Written samples are not added to their database.
www.howoriginal.com

EVE (Essay Verification Engine)
A downloadable application that performs complex searches against text, Microsoft Corp. Word files, and Corel Corp. WordPerfect files.
www.canexus.com

PlagiServe
A free site that checks against paper mill sites to find copied text.
www.plagiserve.com



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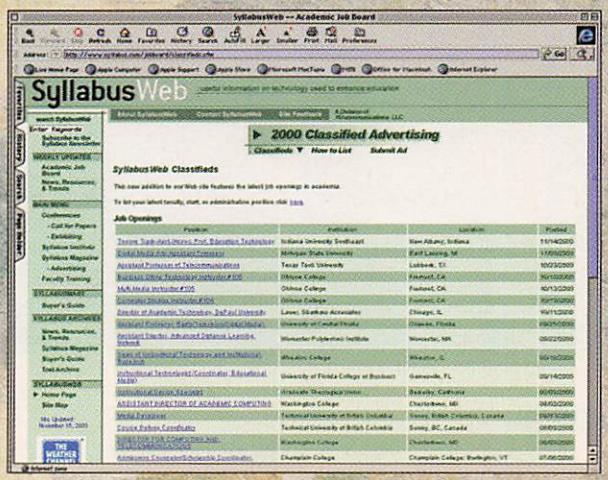

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possible Web sources. But they do so at a cost of their own. The submitted papers may be added to the plagiarism-checking databases, violating the student's intellectual property rights in the process.

Plagiarism isn't limited to text, however. The increasing complexity of software programs makes it harder to detect the use of computer code copied from one program and inserted into another. Alex Aiken at the University of California, Berkeley, has developed an open source software program for comparing software code for similarity (www.cs.berkeley.edu/~aiken/moss.html).

What relationship do faculty members want to have with their students: enforcer and violator, or mentor and apprentice? The technology of document distribution (e.g., paper mills) and the tools of copyright prevention (plagiarism checkers) will co-evolve. Instead, we should examine why students choose to plagiarize. Do they value the learning opportunities in class? Do the writing assignments challenge them and help them find relevance in their lives and experiences? What happens to the written assignments that are submitted? Are they woven back into the course to help students?

Writing in the November 16 issue of the *Chronicle of Higher Education,* Rebecca Moore Howard, associate professor of writing and rhetoric at Syracuse University, admonishes us that the shortcomings of faculty are not an excuse for students' plagiarism (chronicle.com/weekly/v48/i12/12b02401.htm):

"We deprive our students of an authentic audience if we assign papers that are due at the end of the term and that the students never see again. We deprive them of an interested audience if we scrawl a grade and 'good work' on a paper—and nothing else. We deprive them of a respectful audience if we tear apart the style, grammar, and mechanics of their papers, marking every error and accusing them of illiteracy for their split infinitives, without ever talking with them about what they were trying to accomplish, how they might achieve their goals, and why all the style, grammar, and mechanics matter anyhow."

In short, we would be wise to take a closer look at the pedagogy enlisted in the search for knowledge, and its relevance to students' lives, before calling in the plagiarism police.

Anti-Plagiarism Resources

The Center for Academic Integrity
An association of more than 225 institutions that provides a forum for identifying and promoting the values of academic integrity.
www.academicintegrity.org

What is Plagiarism?
Guidelines from the Georgetown University Honor Council.
www.georgetown.edu/honor/plagiarism.html

Avoiding Plagiarism
Guidelines from the Office of Student Judicial Affairs at the University of California, Davis.
sja.ucdavis.edu/avoid.htm

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OpenCourseWare: Simple Idea, Pro

By Phillip D. Long
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

On April 4, 2001, Charles Vest, president of the Massachusetts Institute of Technology, announced the beginning of the OpenCourseWare project (OCW) in a press conference that was simultaneously Web cast. "As president of MIT, I have come to expect top-level innovative and intellectually entrepreneurial ideas from the MIT community.... I have to tell you that we went into this expecting that something creative, cutting-edge, and challenging would emerge. And, frankly, we also expected that it would be something based on a revenue-producing model—a project or program that took into account the power of the Internet and its potential for new applications in education. OpenCourseWare is not exactly what I had expected." Frankly, neither did anyone else.

What is OCW?

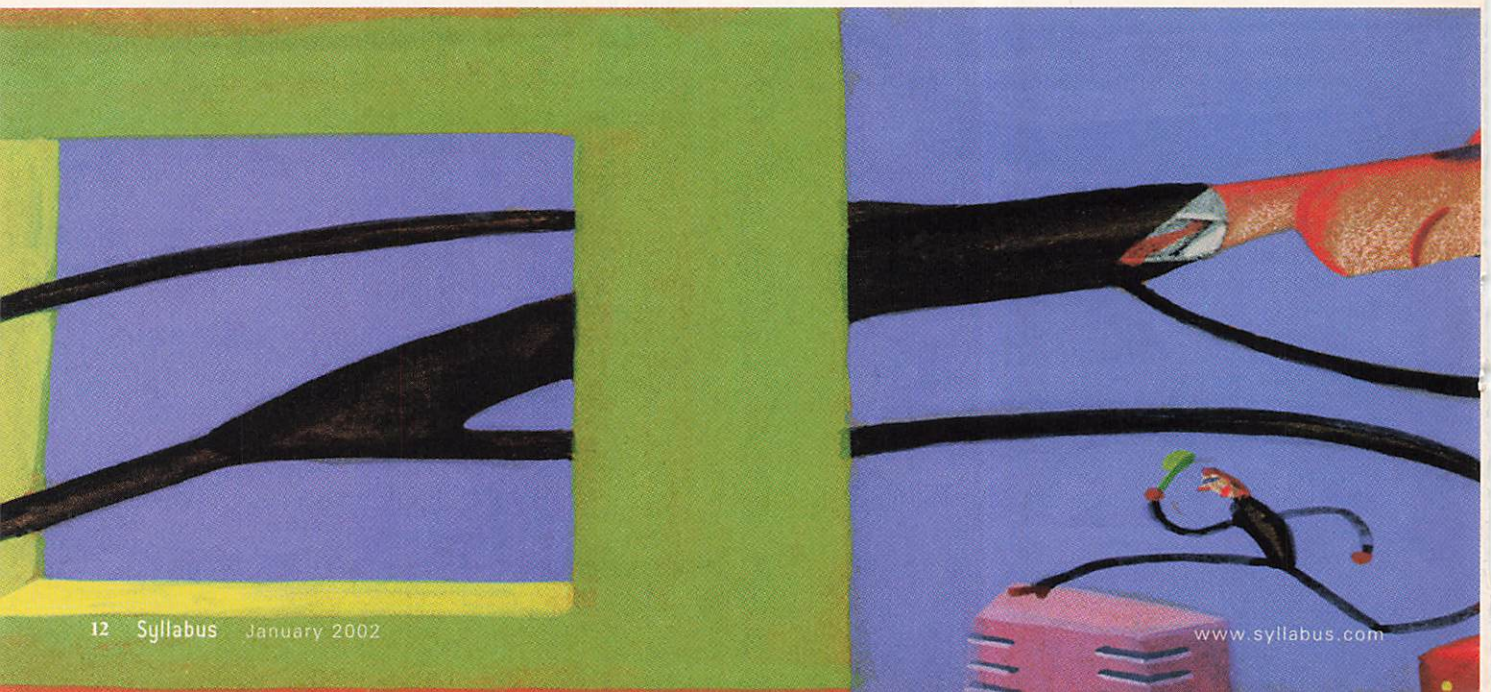
Since its inception, OCW has been misunderstood. The academic world has seen one or another online degree program or commercial venture stake a claim to its part of cyberspace. OCW is not about online degree programs. It isn't even about online courses for which students can audit or enroll. That's what it isn't. What, then, is it?

OCW is a process—not a set of classes. This process is intended to make the MIT course materials that are used in the teaching of almost all undergraduate and graduate subjects available free online to any user in the world.

The goal of OCW is to provide the content that supports an MIT education. Ultimately, the OCW Web resource will host the materials for more than 2,000 classes taught at MIT, presented with a coherent interface that will include sophisticated search algorithms to explore additional concepts, pedagogies, and related attributes across the site as well as within a course.

The OCW announcement elicited varied reactions. Many wondered how this effort differs from any number of instances where universities have made their course Web sites available to the public, all or in part. The more cynical expressed admiration for the public relations success. The announcement made the front page of the *New York Times,* but skeptics asserted that OCW would be nothing more than a traditional Web site dressed up with a new acronym. But the

Illustrated by Eric Giriat



found Implications

elegance is in its simplicity. The closer one looks, the more one sees.

Still, an important and often overlooked implication of OCW is another aspect of what it is not—it is emphatically not an MIT education. This has been emphasized by Vest and other spokespeople for the initiative, but it bears repeating. It is the firm tenant of OCW that the core of an MIT education is the interaction between students and faculty in an environment that invites and supports inquiry and questioning. OCW makes no claim or effort to encapsulate this on the Web.

MIT's OpenCourseWare initiative is a bold step toward the ideal of open scholarship and free access to full course materials and resources online.

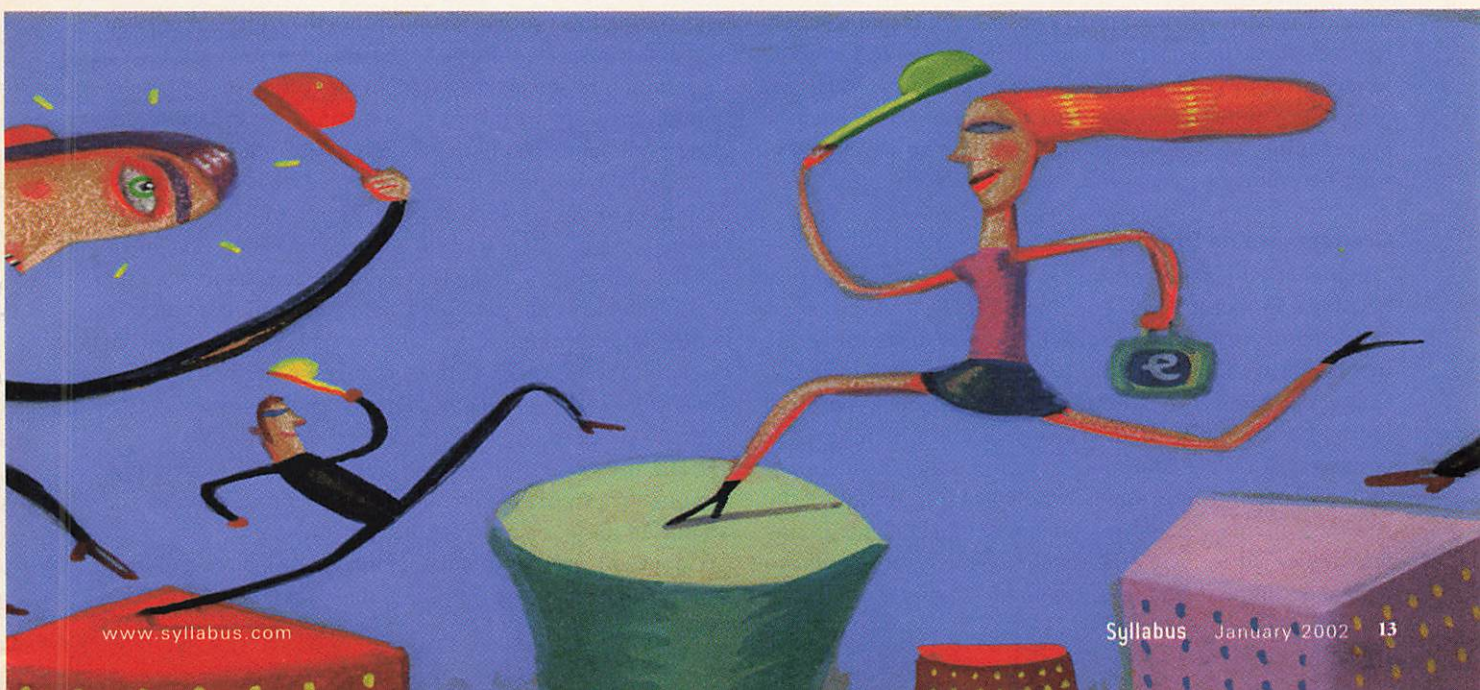
Competing Demands

Even given the support generally garnered on the MIT campus, some obstacles must be overcome if OCW is to be successfully implemented and maintained.

• **Time.** The prospect of putting up the content of some 2,000 courses in the next 10 years is daunting for anyone, even on a campus like MIT. This is all the more challenging given the one thing faculty members have least available—time. The enthusiasm and commitment toward the project is tempered by the uncertainty surrounding the level of effort faculty will be required to invest to make content suitable for OCW.

Teaching and research remain prime concerns for faculty throughout institutions of higher education nationwide and abroad. A project like this must not add significantly to the workload of already challenged faculty members, nor can it detract from their current commitments. A research question for such an effort is therefore: How can we assemble and distribute content with minimal faculty involvement?

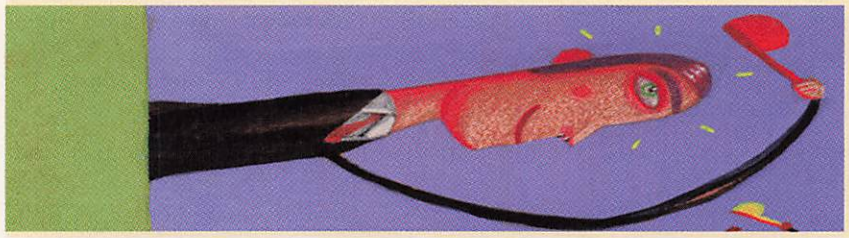
• **Reusable learning objects.** A corollary to the time-constrained faculty member is the requirement that learning objects created for a course must be found suitable for other purposes, such as OCW. Faculty members cannot be expected to create content twice, once for teaching and again for presentation to the broader academic public. Thus, a second objective for the project is understanding the requirements for transformation of learning objects from their in-class instructional use to their representation as meaningful content for those inter-



Minimum Open Source Licensing Criteria

Excerpted from the open source definition by the Open Source Initiative (www.opensource.org)

1. There is free redistribution of licensed code for open software, whether or not it is included in a larger package from multiple sources.
2. The source code is available.
3. Modifications and derived works are allowed and distributed under the same terms as the license of the original software.
4. The open source license must guarantee that the source be readily available, but may require that it be distributed as a pristine base source plus patches.
5. Discrimination against any person or group of persons is not allowed.
6. Restricting anyone from making use of the program in a specific field of endeavor is not allowed.
7. Additional licensing agreements may not close access to the distributed software.
8. Open software licensing rights are not restricted to a particular distribution; that is, any piece of open software code must remain faithful to these requirements even if it is included among other proprietary code.
9. The license must not restrict other software distributed with the open software; that is, just by including open software with proprietary code, it is not implied that the proprietary code adopt these guidelines.



acting out of the context of the faculty/student/course/setting intersection.

• **Production process.** Putting together a Web site for a course is, despite current technologies to assist site designers, a significant effort. Currently, trade-offs are made in order to achieve some degree of scalability in the various systems used to aggregate content for teaching. For example, learning management systems may provide a limited suite of templates with form-based content uploading, designed to distribute the labor required to ingest and position the content within the site's framework. The trade-off is often restricted pedagogical flexibility and relatively basic, cosmetic design choices for the reduction in the effort needed to auto-generate large numbers of course "shells." A project such as that undertaken by OCW must incorporate new opportunities to achieve scalability for content development while not entirely sacrificing individuality in site design.

Courseware as Product

The higher education community has become subject to a new force in recent years. The trend has been referred to as "education as a good" (Schlais, 2001), describing the increasing trend toward the privatization of knowledge. Colleges and universities, in his view, are becoming more and more like vendors to students, who perceive themselves as customers of college education services. During the bloom of online distance education—curtailed only recently by the general economic recession—competition for students among universities led to increasing costs. Revenues were sought to replace declining public subsidies and to support competitive consumerism. Not-for-profit subsidiaries of traditional colleges, for-profit private universities, and corporations emerged, seeking to gain a larger share in what seemed an infinitely expanding demand for anywhere, anytime learning.

The privatization of knowledge has many manifestations. One is the frightening rise in the cost of scholarly journals. The pattern is familiar to anyone working in the academy. Schlais describes the conundrum like this: "A faculty member spends years of her life learning, researching, thinking, organizing, teaching, and writing. Her university invests substantially during this process. She publishes the fruits of her labor in a highly respected journal. And finally her library buys a subscription to the journal, sometimes costing in the tens of thousands of dollars per year." Something is amiss, and our library colleagues have been painfully aware of it for years.

Copyright and legal interpretations deepen the concern. According to the World Trade Organization (WTO), and the General Agreement on Trade in Services, education is an international commodity. In the United States, compliance with the WTO agreements was accomplished in part by the enactment of the Digital Millennium Copyright Act in 1998. Jessica Litman described the relevance of these changes in her book, *Digital Copyright: Protecting Intellectual Property on the Internet* (2001):

"1. The use of digital works, including viewing, reading, listening, transporting, etc., requires a reproduction of the original of the work in a computer's memory.
2. Copyright statutes give clear and exclusive control over reproduction (as defined above) to the copyright holder.

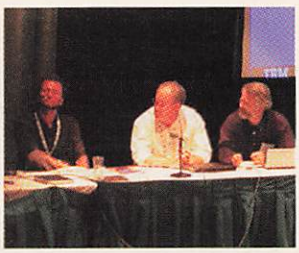
Illustrated by Eric Giriat

Syllabus2002

NINTH ANNUAL SUMMER CONFERENCE

Planning and Innovation:

Moving Campus IT Forward



Syllabus2002 is a conference for faculty, administrators, and information technology professionals who want to explore the latest applications of IT in higher education institutions. The conference offers a full program and an environment in which attendees encounter exemplary campus implementations for teaching as well as administration and discover how new media are best integrated into the teaching and learning process.

- Keynotes
- Featured Panels
- Breakout Sessions
- Poster Sessions
- Exhibits
- Technology Classrooms
- Pre-conference Workshops and Seminars

Conference tracks examine central themes and key technologies that have become increasingly important to diverse constituent groups in higher education as they move forward with strategic technology planning and innovation.

- New Technologies Update
- Administrative Systems for the Academic Enterprise
- Technology Infrastructure and IT Planning Issues
- Standards, Interoperability, and Open Source
- New Publishing Models and Intellectual Property
- Web-Based Environments for Teaching and Administration
- Evaluation and Assessment Strategies
- Faculty Innovation: Case Studies

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3. For each use of the copyrighted material, that is, each viewing, listening, transfer, the user needs to have the statutory privilege of the copyright holder."

Faculty members at MIT, as well as other universities, are concerned that their intellectual property may be locked away from their peers, as well as potential students, behind proprietary barriers. Participating in OCW is a proactive statement that "reflects the idea that, as scholars and teachers, we wish to share freely the knowledge we generate through our research and teaching" (Miyagawa, 2001). As Vest noted, "OpenCourseWare looks counterintuitive in a market-driven world." Indeed.

A New Model of Scholarly Sharing?

OCW is often thought of as the educational content equivalent to the open source software movement. The analogy is appealing and reflective of many, but not all, of its goals. Taking a closer look at what constitutes open source software might help.

The open source definition from the Open Source Initiative describes the distribution of software code that adheres to certain licensing criteria (see box, page 14). The application of these principles has one intent—to allow people to read, improve, adapt or modify, fix, redistribute, and use open source software. The definition recognizes that improvements to complex code are made exponentially faster if more people can look at it and lend their intellectual input toward making it work better.

OCW has a similar intent. As put forth in MIT News (2001), "it expresses our belief in the way education can be advanced—by constantly widening access to information and by inspiring others to participate." But it is not the equivalent of a course. Rather, it is a window into what one institution, and what one faculty member, has chosen to convey. It is that person's view of the necessary material for learning a defined subset of a discipline at a particular level of sophistication (freshman or sophomore level, for example, or perhaps the fourth course in a sequence). In one sense it is only that, but in another sense, it is really much more.

OCW embraces characteristics of another major project in higher education, the Carnegie Academy for the Scholarship of Teaching and Learning. A scholarship of teaching involves responsible stewardship, characterized by constantly scrutinizing the quality of one's work, subjecting that work to the critical examination of others, and sharing it with others in one's professional community. As Lee Shulman, president of the Carnegie Foundation for the Advancement of Teaching, clearly puts it, "Scholarship entails a responsibility to pass on what you have found, what you have invented, [and] what you have created [to] the other members of your community, assuming that they will do the same for you."

The presentation of material in OCW is designed to encourage exploration. One can discover interesting and useful associations between and among elements within the OCW collection of course content. The project relates concepts not only within a course, but across courses within a discipline of study—for example, by using metadata tagging. Deciding how to achieve this goal is a daunting task. Skeptics will scoff, questioning if the goal is achievable and if it is even anything new. There will be challenges. Some faculty will question the trade-off in potential earnings, based on their perception of the value proposition in their intellectual work. The time investment and production efficiencies that must be achieved to unburden faculty contributing to OCW remain to be developed, let alone demonstrated.

Sometimes the simplest ideas are the most compelling. What if the processes that underlie this effort were undertaken not just at MIT, but at other universities, disciplinary societies, and libraries around the globe? This expresses a belief in the way education can be advanced—by constantly widening access to information and inspiring others to participate.

Phillip D. Long *is senior strategist for the Academic Computing Enterprise at MIT.* ***longpd@mit.edu***

RESOURCES

Applying Open Source Principles, Practices, and Tools to Teaching, Learning, Professional Development, and Planning. www.tltgroup.org/opensource/base.htm

Carnegie Academy for the Scholarship of Teaching and Learning. www.carnegiefoundation.org/CASTL/index.htm

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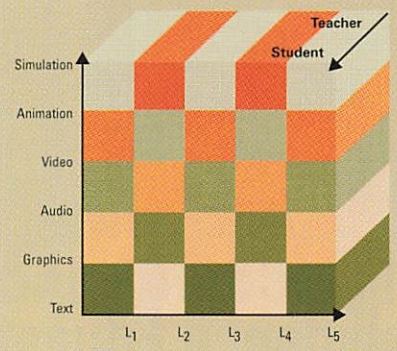
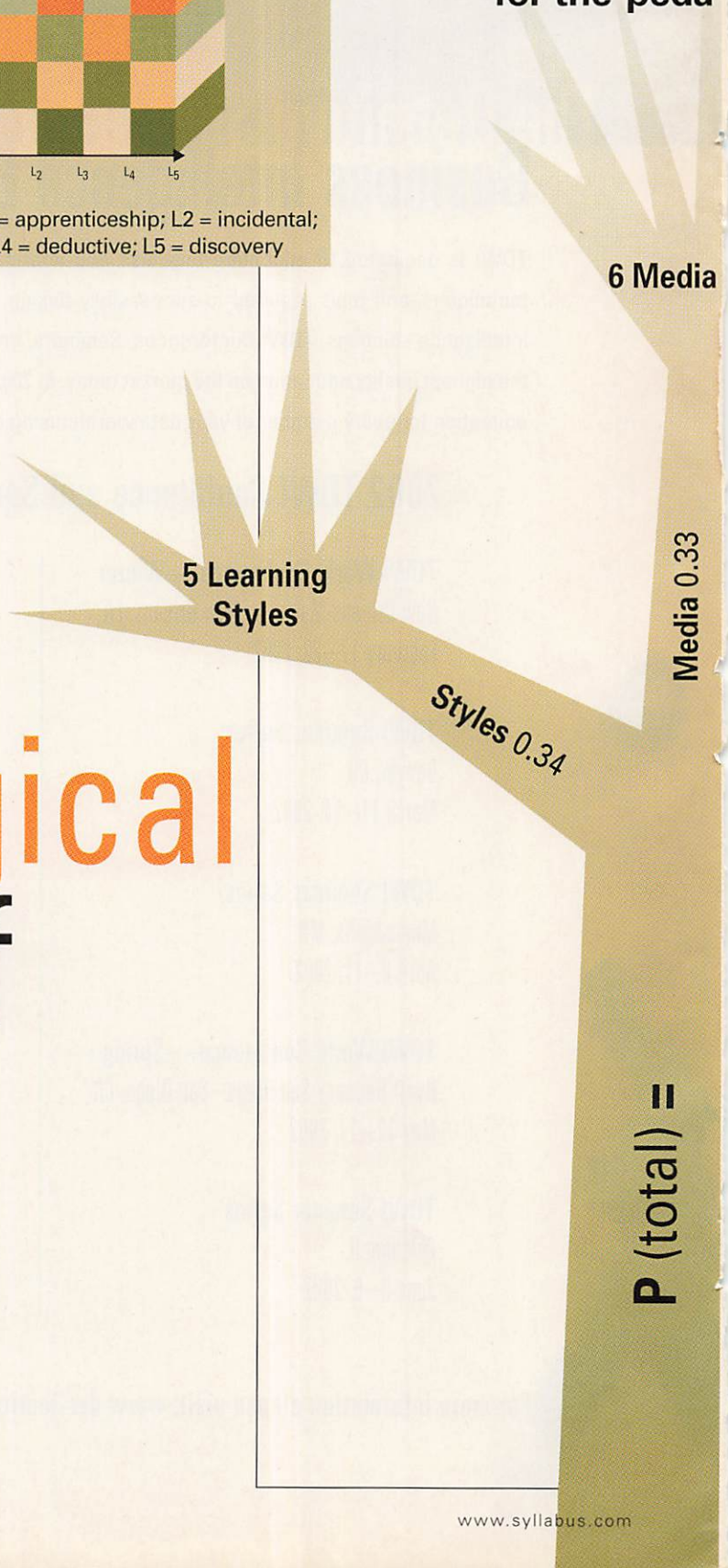
Figure 1: The learning cube



Learning styles: L1 = apprenticeship; L2 = incidental; L3 = inductive; L4 = deductive; L5 = discovery

Figure 2: Pro for the peda



A New Methodology for Evaluation:

The Pedagogical Rating of Online Courses

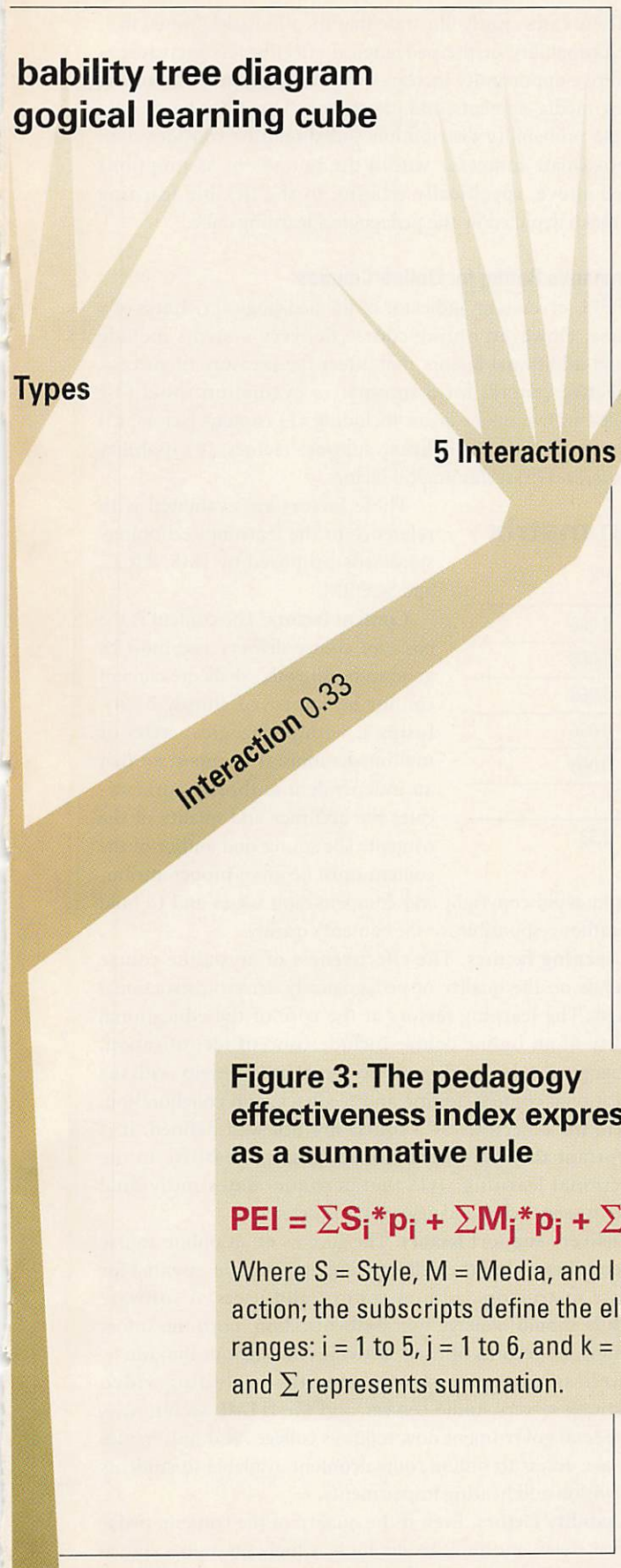


Figure 3: The pedagogy effectiveness index expressed as a summative rule

$$PEI = \Sigma S_i * p_i + \Sigma M_j * p_j + \Sigma I_k * p_k$$

Where S = Style, M = Media, and I = Interaction; the subscripts define the elements' ranges: i = 1 to 5, j = 1 to 6, and k = 1 to 5; and Σ represents summation.

In articles appearing in our November and December issues, **Nishikant Sonwalkar** examined the elements of online learning within the structure of a "learning cube." Here, he proposes an instrument for evaluating online courses based on those elements.

Nishikant Sonwalkar
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Online course offerings are increasing in number every day. Most universities and corporate training facilities now offer some or all of their courses online. In fact, more than 1,000 corporate universities and online providers offer courses in everything from information technology to Chinese cooking. Although it is clearly advantageous for asynchronous learners to access educational information and content anywhere and anytime, it is difficult to evaluate the quality and effectiveness of online courses and learning modules.

Growing Need for Evaluation

Open source learning platforms and public access to online course content are increasingly popular because higher education can benefit from joint development efforts and shared resources, which ultimately reduce the cost of online learning. Consortia are sharing volumes of information and courseware, and several vendors are providing their technology as open source materials.

In the open source, open content environment we are entering, it is important to develop a common, objective scale and summative instrument with which to measure the pedagogical effectiveness of online course offerings.

Models of Evaluation

In my two previous articles in *Syllabus* (November and December 2001), I described the pedagogical learning cube (see Figure 1) in the context of instructional design. In this article, I'll again invoke the cube, including the five functional learning styles—apprenticeship, incidental, inductive, deductive, and discovery (x-axis); the six media elements—text, graphics, audio, video, animation, and simulation (y-axis); and the third axis of the cube (the z-axis), which represents the interactive aspects of learning.

The z-axis indicates the degree to which students are engaged with the learning content, moving from a teacher-centric to a student-centered approach. This interactivity axis (z-direction) of the cube may be defined in terms of five elements: system feedback, adaptive remediation and revision, e-mail exchange, discussion groups, and bulletin boards. With this definition of the learning cube, a framework can be constructed to define pedagogy as a 3D space.

Pedagogical effectiveness is at the heart of online offerings and

defines critical parameters for the evaluation of courses. However, learning management systems provide the essential integrative layer for online courses. If online courses are delivered in the context of learning management systems, several additional factors must be considered in any evaluation.

I propose a new instrument for overall evaluation, based on a five-factor summative rating system plus a pedagogy effectiveness index (PEI). The intent of the methodology described here is to create objective criteria for evaluating the quality of online courses based on the existing elements that represent pedagogical content.

The Pedagogy Effectiveness Index

Expanding on the above arguments, the pedagogical effectiveness of an online course can be defined as a summation of learning styles, media elements, and interactivity.

Assuming that each of those factors are equally likely and mutually exclusive, a probability distribution tree diagram (see Figure 2, page 19) can be shown to have three branches, with sub-branches represented for each axis of the pedagogical learning cube. A PEI can therefore be determined by a summative rule (see Figure 3, page 19). The corresponding probability multipliers can be shown in a simple matrix (see Figure 4).

Figure 4: Simple probability distribution matrix

Style	Pi	Media	Pj	Interaction	Pk
Apprenticeship	0.068	Text	0.055	Feedback	0.066
Incidental	0.068	Graphics	0.055	Revision	0.066
Inductive	0.068	Audio	0.055	E-mail	0.066
Deductive	0.068	Video	0.055	Discussion	0.066
Discovery	0.068	Animation	0.055	Bulletin	0.066
		Simulation	0.055		
Total (weighted)	0.34		0.33		0.33

Consider the following cases as examples of the application of the PEI.

Case 1: The PEI for a course with one learning style, one media element, and one interactive element will be:

$$PEI = 0.068 + 0.055 + 0.066 = 0.189$$

Case 2: The PEI for a course with three learning styles, four media elements, and two interactive elements will be:

$$PEI = 3*0.068 + 4*0.055 + 2*0.066 = 0.556$$

Case 3: The PEI for a course with five learning styles, six media elements, and five interactive elements will be:

$$PEI = 5*0.068 + 6*0.055 + 5*0.066 = 1.0$$

These cases clearly illustrate that the PEI varies from 0 to 1. The probability of the pedagogical effectiveness increases as cognitive opportunity increases with the inclusion of learning styles, media elements, and interaction. The PEI is based on a simple probability distribution and should be considered an approximate indicator within the bounds of assumptions listed above, specifically relating to the flexible learning approach depicted by the pedagogical learning cube.

Summative Rating for Online Courses

The PEI serves as an indicator of the pedagogical richness of a course. However, online course delivery systems include several additional factors that affect the measure of success. Objective criteria for a summative evaluation should be applied in five major areas, including (1) content factors, (2) learning factors, (3) delivery support factors, (4) usability factors, and (5) technological factors.

These factors are evaluated with reference to the learning technology standards proposed by IMS, AICC, and SCORM.

Content factors. The content is the basis for course delivery and must be good to begin with. Mediocre content cannot be improved simply by infusing it with pedagogical styles or multimedia tools. It is important that an independent authority authenticates the accuracy and quality of the content. The source and author of the content must be given proper attribution to avoid copyright and compensation issues and to hold the author responsible for the content's quality.

Learning factors. The effectiveness of an online course depends on the quality of pedagogically driven instructional design. The learning factors at the core of the educational quality of an online course include concept identification, pedagogical styles, media enhancements, interactivity with the educational content, testing and feedback, and collaboration. Often, the objectives of a course are not well-defined. It is important that the instructional design is sensitive to the functional learning style that accommodates individual content sequencing and aggregation preferences.

Delivery support factors. The success of an online course depends heavily on the delivery support function essential for course instructors, administrators, and users. A software module should manage user authentication, portfolio information, and records of users' activities throughout the course, as well as course content elements—including video streaming servers, audio servers, and the HTML server. Also, the federal government now requires colleges and universities to make access to online course content available to students with vision and hearing impairments.

Usability factors. Even if the quality of the content, pedagogical styles, and multimedia tools is high, an online course

can be a complete failure if usability is poor. Users interact with online Web courses through a graphical user interface, so the design of graphic elements, the color scheme, the type fonts, and navigational elements can all affect how a course is organized and perceived by students.

Web pages that are loaded with information require excessive scrolling within a window and can be detrimental to the educational quality of the presentation. Design experts recommend presenting small chunks of information in 800x600-pixel windows. Page layout and ease of access from other parts of the course site are crucial to the success of an online course.

Technological factors. The issues that influence the technological success of online courses include available bandwidth, target system configuration, server capacity, browser software, and database connectivity. The network bandwidth defines what is the lowest common denominator for the course Web page. Designing for 56 kilobits/sec modem access has more limitations than designing for a T1 network connection of 1 megabit/sec. The number of simultaneous users a Web server can handle is also an important constraint for the large-scale deployment of online courses.

Designing courses to run via Microsoft Corp.'s Internet Explorer vs. Netscape Communications Corp.'s Navigator can make a difference in the kind of HTML 4.0 vs. JavaScript features that can be included. The choice also has an impact on the plug-ins that may be required to run interactive applications. Most large-scale online courses are powered by a database back end. The database connectivity and connection pooling mechanism can become a bottleneck if not dealt with properly.

Most rating systems are summative and depend on a precise definition of the quantitative scale. The most widely used rating system is the Likert scale, which I have selected for the proposed summative evaluation instrument (see Figure 5).

An Overall Rating

The summative evaluation results (the sum of the ratings of all the factors in each of the five categories) and the PEI can be combined to give a final result that provides a view of the overall effectiveness of the online course:

Overall Rating = PEI x Summative Rating Score

The advantage of using the overall rating formula lies in the ability to incorporate the scores of both the pedagogical and delivery systems to provide a final rating that will be useful for comparing online course offerings.

The pedagogy effectiveness index and the summative evaluation instrument used in combination can be powerful tools for evaluating large numbers of online offerings. These criteria have a clear emphasis on pedagogically driven design. Widespread use of these tools could guide and motivate online education developers, universities, and training centers toward the creation of educational systems marked by measurable success.

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Figure 5: Summative evaluation instrument for rating online courses

No.	Evaluation Factors	Absent	Poor	Average	Good	Excellent
1	**Content Factors** Quality Authenticity Validity Media Presentation Attribution	0	1	2	3	4
2	**Learning Factors** Concept Identification Pedagogical Styles Media Enhancements Interactivity Testing and Feedback Collaboration	0	1	2	3	4
3	**Delivery Support Factors** User Management Course Content Accessibility Reporting	0	1	2	3	4
4	**Usability Factors** Graphical User Interface Interactive Design Clarity Chunk Size Page Layout	0	1	2	3	4
5	**Technological Factors** Network Bandwidth Target System Configuration Server Capacity Browser Software Database Connectivity	0	1	2	3	4

Sally M. Johnstone

As founding director of the Western Cooperative for Educational Telecommunications at the Western Interstate Commission for Higher Education, Sally M. Johnstone serves as a resource on higher education technology issues. She also serves on the board of the American Association for Higher Education, the U.S. Open University's Board of Governors, and the Advisory Panel for the Consortium for the Advancement of Private Higher Education.
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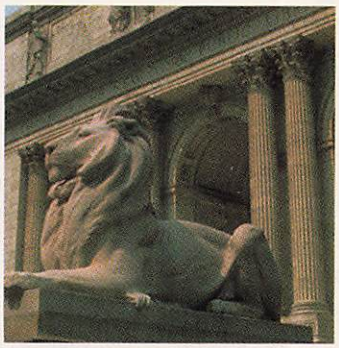
Hopes for Distance Learning in 2002

As the calendar year changes, I find myself shifting back and forth between reflecting and planning. On the reflection side, I recall some interesting discussions in which I participated in the last few months of 2001.

Terry Hilsberg, chief executive officer of NextEd, based in Hong Kong, shared his story in a couple of public forums. He works with distance learning institutions in Australia, New Zealand, and the United Kingdom. His partners all offer low-priced programs in China through local learning centers that NextEd develops in partnership with Chinese institutions. They have tens of thousands of students studying electronically with faculty half a world away.

He points out that American institutions are conspicuous by their absence. Those that are reaching out to the Asian market have priced their programs so high that they are available to only a small number of people. He also claims that by the time U.S. institutions are ready to serve Asian populations at an affordable price, all the others will have the market cornered.



Dennis Jones, president of the National Center for Higher Education Management Systems, talked about the need to change state policies for higher education funding. If institutions are only given state funds for students who take their classes, states are encouraging unnecessary competition in an expensive part of distance learning: course production. They are also not encouraging good service for students who use local colleges for technology, library access, and support but use course materials from another institution. This financing strategy may have worked well for face-to-face activities, but it puts the full costs of distance learning directly on students.

It seems the U.S. model of higher education will not allow us to compete globally unless we can shift our "cottage industry" philosophy. Different types of institutions will have to specialize and be funded for the distance learning activities on which they focus.

So much for the memories. On the planning side of my thinking about the new year, I like the notion of using distance learning to enhance the role of the United States worldwide. Our image around the world is a bit tarnished. We have vast resources of knowledge that we share only with those who can afford the high prices we charge for our boutique degrees delivered at a distance. On a grand scale, the Massachusetts Institute of Technology's OpenCourseWare project shows us that we do not have to ration our intellectual resources. We can share them for little cost to us.

Even when course materials are offered online for free, there are still barriers to using them. Not everyone in the world understands the same languages or can access the Web. These problems may work themselves out over time and through new technological developments, but in the meantime, those of us working in the field of distance learning can begin to find new models for sharing resources.

I do not mean to imply that taking a course from a specific institution should be free. The costs of activities associated with actually taking a course for credit must be covered. It may even be possible for some institutions to make money offering such courses. But not all courses or sets of course materials can be profitable. Because there is not always money to be made, we can pull the knowledge out of any specific course. We can technologically open the vast store of human knowledge to anyone on earth who wants it. We can begin to re-create the equivalent of the original vision for public libraries: free access to knowledge.

Illustrated by T. J. Florian

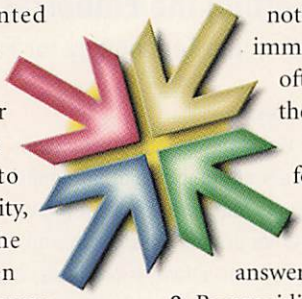
David G. Brown

David G. Brown is vice president and dean of the International Center for Computer Enhanced Learning. He has served as president of Transylvania University, chancellor of the University of North Carolina at Asheville, and chair of several national groups, including the American Association for Higher Education and the Higher Education Colloquium. As provost of Wake Forest University, he founded the Annual Conference of Ubiquitous Computing Colleges and Universities, and founded the Journal of Computer-Enhanced Learning.
brown@wfu.edu

Interactive Teaching

Increased interaction is one of the five "holy grails" sought by 150 professors when they spent time and effort to incorporate computer enhancements into their teaching. The other four teaching strategies are the use of controversy and debate, the involvement of "outside" experts, student-with-student collaboration, and customized learning.

By far, the quickest and greatest learning gains from computerization come from increased interaction and better communication among students, and between students and their professors. In my own course of 15 students, one semester I counted 1,247 individual e-mails between me and my students. That's nine e-mails per week per student. Overall, this close communication allowed us to become a true learning community, where each of us supported the others. With most classes, even two or three years after these communities are established, e-mail exchanges continue.



When on the lecture circuit, I often encourage audience members to list ways—using both high and low tech—that they increase interaction in their own classes. The results are almost always mind-expanding. As a catalyst, here is a selective list of how I interact with my students:

1. E-mail me your muddiest point. I'll consolidate the points received from all class members and e-mail my answers back to the entire class.
2. E-mail me your reactions to several Web sites that relate to the topic of the week. I'll check you off for having completed the assignment.
3. When you spot a newspaper story that relates directly to our course, use our group e-mail to inform the entire class (and send a copy to the group e-mails of several of my previous classes on the same topic).
4. Plan to check your e-mail at least every 24 hours, so that I can feel comfortable changing an assignment between classes.
5. After I complete my lecture, e-mail me a paragraph that explains in your own words the key concept. If most of the e-mails miss the mark, I can then approach the topic in a different way.
6. At the beginning of a class, I sometimes ask each student to e-mail me a brief paragraph on what they learned in the previous class. Once students come to expect this, I have noticed that the chatter in the room immediately before the class starts is often a student-to-student review of the last class.
7. When a student raised a follow-up question after a lecture, I challenged class members to answer it, then shared the best answer with the entire class.
8. By providing a portion of my lecture online before class, time is left during class for face-to-face discussion.
9. During class, I often ask three or four students to work in a team to prepare a short Microsoft Corp. PowerPoint presentation (often a single slide) that answers a discussion question. Often I will then provide the answer I would have given if I had lectured on the topic.

Even the casual observer will note that most of the things mentioned above can be done without computers. That's right. And if computers aren't available, they should be done by sending groups of students to the board, by asking students to meet between classes face-to-face, etc.

In the spirit of interaction, drop me an e-mail chronicling some of the things you are doing to support interactive learning. My address is brown@wfu.edu.

Steven W. Gilbert

Steven W. Gilbert joined the American Association for Higher Education as director of technology projects in July 1993. He founded the TLT Group as the Teaching, Learning, and Technology Affiliate of AAHE in January 1998. He was previously vice president of EDUCOM, where he created and led the Educational Uses of Information Technology program and the EDUCOM Software Initiative. He also moderates the Internet Listserv AAHESGIT.
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Achieving the Embarrassment Level

The increasing power and pervasiveness of computers, telecommunications, and information resources has made the digital divide impossible to ignore. Within higher education, well over half of all courses now include at least some use of e-mail or the World Wide Web.

Efforts to define and help people achieve "information literacy" are also increasing. Faculty and students who cannot fully and comfortably use basic computing tools and information resources are missing out on an increasing array of teaching and learning options.

I was surprised recently to discover that when I visit a campus for a presentation or consultation, I still need to ask about the minimum technology configurations available to most faculty and students—and that I need to ask explicitly about adjunct faculty. On many campuses, the apparently unintended variation in access to technology and support

Setting the Embarrassment Level

Minimum Technology for Faculty at a Mainstream University

Access

- Desktop or laptop computer less than four years old (about 75th percentile in all measurements that matter except price)
- Color printer, possibly shared, within 50 yards
- Suite of software products, including at least word processing, e-mail, presentation tool, Web browser, spreadsheet, and Web-based course management tools—all compatible with the latest versions from the same software publisher
- Fastest commonly available modem, Ethernet or other connection for Internet access with greater bandwidth than telephone modems provide
- No individual usage fees for accessing a basic set of databases and related services recommended by a professional library association group
- Help-desk capacity sufficient to respond to phone or e-mail messages with answers or referrals within one hour
- Some kind of almost immediate support for those teaching in a "smart" classroom

Capability

- Able to operate basic computing and printing functions
- Able to perform most basic operations required by word processing software, e-mail, and Web browser
- Able to post course syllabus and some readings for students on Web
- Able to recognize when telecommunications connection is down or slow
- Knows when and whom to contact about problems
- Able to open, read, and send e-mail attachments
- Knows how and when to ask a relevant librarian for help
- Able to identify and use a few online information services and databases
- Knows how, when, and whom to ask for help—help-desk professionals, student assistants, faculty peer mentors, and at least one friend or colleague

Usage

- Checks for new e-mail messages at least once a day
- Decides which messages are important and responds to those within 24 hours

services is still great—not only among entering students and longtime faculty, but also among academic departments.

Defining minimum information technology and resource requirements can be like establishing a "poverty level"—local conditions and expectations matter. It may be useful to establish different levels for different departments or divisions, but only if the reasons for doing so are clearly stated and easily defended.

Instead, each area may need its own "embarrassment level." What would those responsible for technology be embarrassed to admit that they couldn't provide for some of their people? Embarrassment is also shaped by expectations. A department or college that aspires to be a leader in educational uses of IT should have a very different set of minimum requirements than one that does not.

I've found it useful to subdivide such minimum levels into three categories: access, capability, and usage. First, what is the minimum configuration of hardware, software, telecommunications connections, information resources, and maintenance services? Second, what is the minimum set of capabilities each individual is expected to have in order to make reasonable use of the available materials and services? Third, in what ways, how often, and with what results are people expected to use the technology?

The combination of uneven distribution of resources and uneven quality of infrastructure is often made more irritating by the lack of a coherent, credible, and widely known IT plan that might explain how and when apparent inequities will be rectified. Once those minimums have been established, they will further raise expectations among those who have not attained them. Therefore, it is even more important to develop a plan for enabling everyone in the organization to reach the goals.

Finally, due to the still rapid pace of change in the underlying technologies, it is important to build in a process for reviewing and revising the minimums to reflect new technology options and new expectations.

The accompanying chart suggests minimums for access, capability, and usage for faculty members at a mainstream institution—one that wants to be neither a leader nor too far behind the leaders with respect to educational uses of IT.

I hope we can establish similar minimum levels for students, professional staff, administrators, and alumni, and for "smart" classrooms, public-access computer labs, and others.

This could be an excellent parlor game activity or challenge for consortia of institutions. Because no college or university is likely to adopt such recommendations without modification, this could be done as a kind of "open-source" exercise—participants contribute improvements as they find flaws and make their own adaptations. At any rate, please feel free to modify these levels and let me know about the minimums at your institution.

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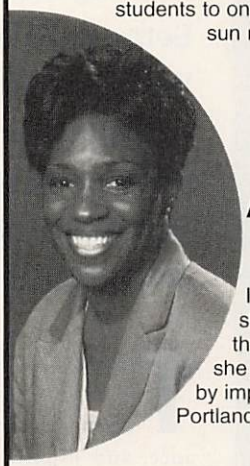

Alumnus
Sheila Booker
Project Manager, Carrera-MAXIMUS
In the past, Booker has used her skills to provide computer training for the underprivileged. In her present job, she continues her goal of empowering people by implementing computer software services for Portland, Oregon public schools.

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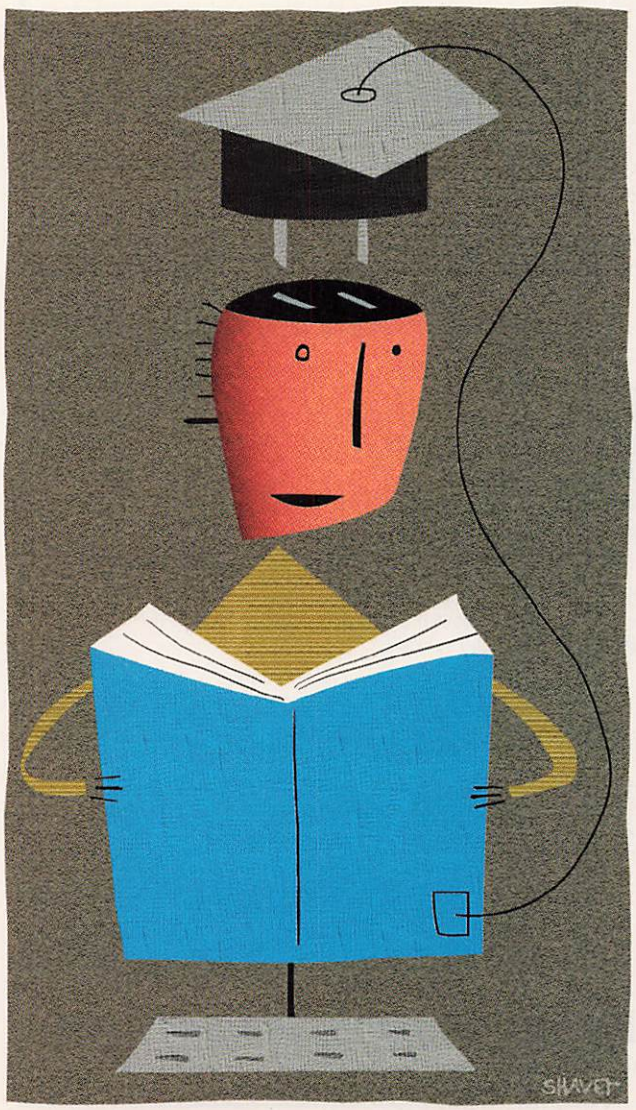
Collaborating to Create Narrative Case Studies

By Elizabeth M. Torcivia, Meryl M. Picard, and Paul Younghouse
SETON HALL UNIVERSITY



Illustrated by Mark Shaver

Several disciplines use narrative case studies to enable students to explore professional roles and experience decision-making and case-based reasoning before entering their fields. Here, we learn how Seton Hall University's Curriculum Development Initiative has fostered collaboration among faculty and instructional designers to create effective multimedia case studies for students in occupational therapy.

The skill of keeping clients at the center of medical problem-solving is critical for all health professions. To maintain humanism in medicine, foster patient compliance, and improve treatment outcomes, future health care providers must be exposed to "whole" people during their training. The pressures that reduce practice to diagnostic problem-solving are of special concern to occupational therapy practitioners, for whom client-centered treatment has historically been the norm.

Interactive Multimedia Case Studies

Thanks to funding made possible through the Curriculum Development Initiative at Seton Hall University, we are now developing four case-based scenarios to use in teaching clinical reasoning to entry-level occupational therapy graduate students. These case studies focus on multidimensional people rather than conditions. They involve clients who fall into specific diagnostic

categories, and they can be used across a curriculum to build increasingly sophisticated clinical reasoning skills. By using multimedia tools to present clients as "whole" people, we can help students develop multifaceted reasoning skills.

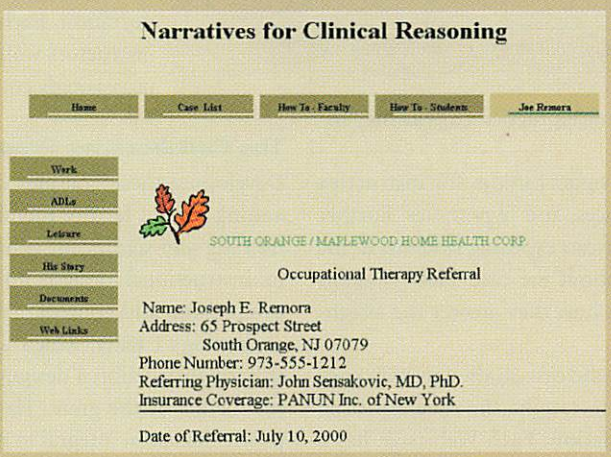
The goal is to give students a sense of the underlying factors that affect health care intervention and outcomes. Because a multidisciplinary team of doctors, nurses, social workers, and therapists provides additional information about each client's story, the cases have excellent potential to be used in other health care fields.

Using an interactive platform—such as HTML-based Web pages or pages created using an application such as Macromedia Inc.'s Director—provides an effective solution for developing learning materials that enhance a case-based approach. These enhancements are designed to keep the "whole" person at the center of our process for teaching clinical reasoning.

Narrative Reasoning as a Clinical Skill

Narrative reasoning, an important part of clinical reasoning, involves pulling together the threads of an individual's life story. This process allows the practitioner to understand how the client experiences the illness or disability and to develop interventions that will improve client outcomes. Traditionally, text-based case studies have been used to promote the development of clinical reasoning in students. Instructors created cases from the literature of the profession or from their own clinical experiences. Text-based cases generally included diagnostic facts and data, as well as sample assessment forms and procedures for using evaluation tools.

Figure 1: Using the case study CD-ROM, students can navigate through various aspects of the client's life, including information about self-care, work, and leisure.



However, relying on diagnostically oriented, text-based cases has led to a conflict between a diagnosis-based pedagogical method and the theoretical emphasis in occupational therapy on the client's occupation, environment, and adaptation. Although education for health professions is typically based on scientific data about disease states and interventions to alleviate dysfunction, occupational therapy students are taught a holistic framework for using activities and daily life tasks (in self-care, work, and leisure) to promote wellness, lessen or eliminate dysfunction, and enable individuals to adapt to life changes.

An Interactive Approach to Teaching Narrative Reasoning

Text-based cases give students clinical information about the diagnostic features of disease and disability. Yet the clinical facts, even with a detailed written narrative, can't substitute for an examination by students of the specific personal features of individuals with disabilities and how those features influence the outcome of medical or therapeutic intervention. Diagnostic information is also limited to the facts about the client; it does not allow students to examine their own beliefs or attitudes regarding the client.

Rather than attempting to describe all of the concrete details of a particular individual's environment and daily activities, adopting a multimedia approach gives us a means to show places and moments in an individual's life in sufficient detail to make them effective simulations of a person's real situation.

We make such case studies interactive by presenting examples of a prototypical client performing daily activities in particular situations. To produce these scenes, we imagine situations in which several factors affecting the success of clinical intervention might come in to play, and then stage a series of vignettes, usually between the client and his or her family members, or between the client and a member of his or her health care team.

For example, in our first case study, one of the instructional activities addresses the self-care needs of a middle-aged man who is unable to use his legs due to multiple sclerosis. Clinical reasoning in this case goes beyond the obvious need for a wheelchair; students must also incorporate knowledge and understanding about the roles of his caregiver and the changes necessary in his home environment. Body type and size, cultural expectations, income parameters, sources of help, and financial constraints all go beyond what can be conveyed effectively in a text-based case.

The vignettes have been developed to enhance the student's understanding of the interpersonal and environmental impact of illness or disability in the context of the client's relationships. We anticipate that each of the case studies will be incorporated into the teaching materials for multiple courses, with the portrayals of human interactions in the vignettes intended to "humanize" the concepts being taught.

The goal of using case study methods is to draw students into the role of therapist. The immersive aspect of interactive multimedia presents case information across multiple senses (sight and sound) and makes the case more compelling, because a multimedia presentation creates a convincing world in which, for example, this client and his wife might be having a discussion of their problems while eating lunch in a favorite restaurant. Students can "overhear" the client express his fears about recovery, his uncertainty about the progression of his

disease, and his anxiety that life roles that are of special importance to him (teacher, traveler, gourmand) will be disrupted.

Instructional Use of Interactive Multimedia Cases

Instructors in other health care professions sometimes bring in either actual clients or actors hired to portray clients. Although this method may be effective for some aspects of developing therapeutic skills (such as interviewing), it also has limitations. Beginning students, for example, require additional time to reflect on how they apply their clinical practice skills as they listen to client responses.

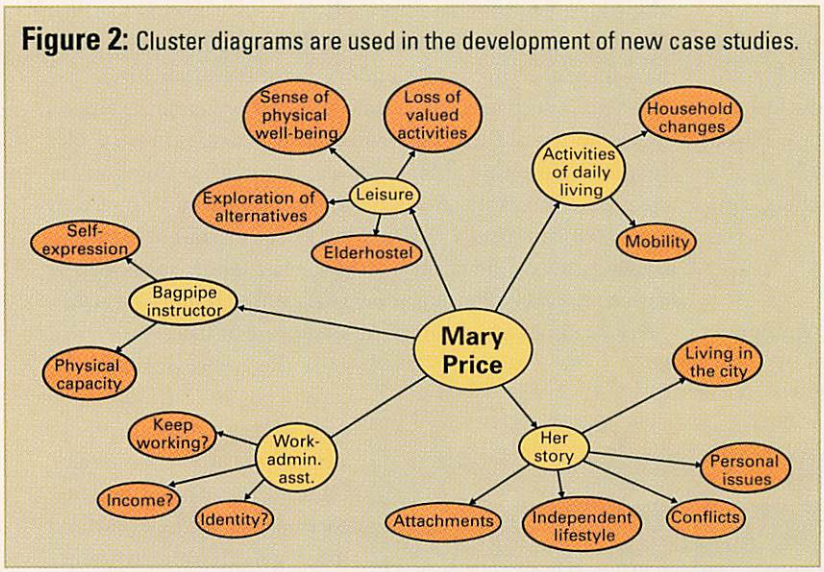


Figure 2: Cluster diagrams are used in the development of new case studies.

Multimedia case studies open opportunities for instructors to model alternative queries, choices, and hypotheses. Further instructional opportunities come from exposing students to the decisions their classmates made about the case. How students approach each case is as critical as how they answer the assignment issues.

Each student is given a copy of the case studies, in Web page format, on a CD-ROM. They are taught the mechanics of searching the disc for the information. Each Web page has a series of navigation buttons that reflect the scope of occupational therapy practice for each client (see Figure 1, page 27). Case information includes areas such as self-care, work, leisure, documents, Web links, and "his story." In our first case study, there is a vignette between the client and his wife, as well as an interactive floor plan of their home.

Students will be given assignments related to one of the case studies. For example, one assignment might be to assess the ability of the client in the first case study (Joe Remora) to return to his campus office. They will need to consider his ability to travel to campus or on campus (by manual wheelchair, power wheelchair, or motorized scooter); his fatigue level; how he will manage bathroom access and obtain his meals; whether his office, classroom, and meeting spaces are wheelchair-accessible; and whether the technology in his office and classroom needs to be adapted. Should he consider teaching his courses remotely, using distance learning technology? Although these issues could theoretically be conveyed in text format, the reality of looking at video clips of this individual and his ability to get in and out of his car will influence students' choices of intervention strategies.

The CD format allows the use of the same case in different classes to explore various facets of the person's life. For example, Joe's case could be used in a first-year course on psychosocial occupational therapy so students can begin to address the facets of depression, adjustment to disability, and changes in family relationships and life roles. Joe might then be seen again in a rehabilitation course in the second year to address the medical issues of multiple sclerosis. Students at this level should be able to start integrating psychosocial and physical issues to create a more holistic view of the person.

A related assignment might focus on the occupational therapy needs that would be addressed by a home health therapist, including the potential time constraints imposed by a third-party payer.

In the third year, students might revisit Joe in an adapting environments course to focus on his low and high assistive technology needs at work, in his home, at leisure, and for his ongoing transportation. Each time students return to the case, instructors would require students to demonstrate increasingly complex clinical reasoning skills.

The Collaborative Process

Developing these complex case studies requires collaboration among several faculty members with appropriate professional training and significant clinical experience, as well as expertise in instructional design, information technology, multimedia production, and content. Seton Hall's Teaching, Learning, and Technology Center, which administers our project, assigned a specific instructional designer/faculty consultant to the project for the life of the grant. Having one person committed to the project has been integral to its success.

The instructional designer's role is to guide faculty members through the planning and production of the teaching materials, striking a balance between sound pedagogy and the allure of new technologies. The goal is to make appropriate use of technology to fulfill instructional objectives, using technology that is available on campus, even as it evolves. This approach keeps planning open and responsive to developments on both sides of the collaboration as the instructional designer learns more about clinical reasoning in occupational therapy and faculty members learn more about instructional uses of technology.

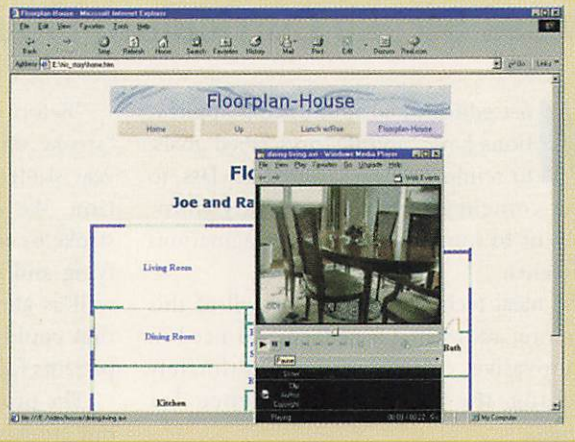
The instructional designer volunteered to become the actor in the first case study. As he immersed himself in the narrative details of the case, his involvement fostered a close working relationship with our team. In turn, this "insider information" prepared him to question the faculty about more specific learning objectives, suggest choices among possible media

presentations to meet those objectives, and facilitate the decision to deliver the cases through a Web-based platform.

Subsequent cases have begun their life cycles during brainstorming sessions. Such sessions use the template developed in the first case to structure the narrative information that will be provided. Cluster diagrams, created with Inspiration software, are used to develop the key instructional issues for the cases, show relationships, and highlight character conflicts (see Figure 2). Decisions about multimedia use are made at this point, and a production schedule is established.

The production process is not scripted. Key issues, important relationships, and critical incidents are explained to the actors, but idiosyncratic character development and spontaneous dialogue are encouraged. Monologues and dialogues are created, rehearsed, and videotaped or audiotaped. In addition, we videotape environments and activities associated with those environments.

Figure 3: Students click on a floor plan to activate video clips of the household.



For the first case, we produced a floor plan of the client's house and shot short video clips of those spaces. The video clips have been integrated with the floor plan in the resulting Web page. Clicking on the name of a room launches the media player to present a moving image of that room, or movement from room to room (see Figure 3).

The project has been shaped by a willingness to look critically at media materials as we generate them and to recognize when additional pieces are needed to present other features of the multidimensional character and his or her complex narrative. This has generated a collaborative partnership between two key segments of the academic community—faculty and instructional designers—to the benefit of all.

Elizabeth M. Torcivia (torcivel@shu.edu) and Meryl M. Picard (picardme@shu.edu) are assistant professors in occupational therapy, and Paul Younghouse (younghpa@shu.edu) is a faculty consultant and instructional designer, all of Seton Hall University.

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A Web curriculum creates awareness; medical school network gets traffic cop; art school methods incorporated in the lab; Web audio aids language learning; administering online exams; training students for tech support.

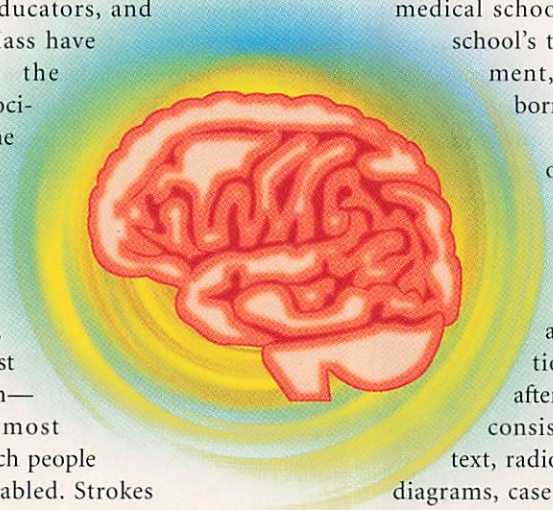
TECHNOLOGY ACROSS THE CAMPUS

UMass Stroke Curriculum Flourishes on the Web

Most educational multimedia applications have carefully prescribed goals: to reinforce ideas covered in class, to deliver content interactively and asynchronously, or to simply capture the imaginations of students.

The ideal technology tool does all of this and more, addressing a pedagogical need in an innovative, creative way and ultimately enriching the learning experience for students.

That appears to be the case with StrokeSTOP, a new stroke curriculum developed at the University of Massachusetts Medical School. Scientists, educators, and technologists at UMass have collaborated with the American Stroke Association, a division of the American Heart Association, to create the first online stroke curriculum for medical students.



Among Americans, stroke is the third most likely cause of death—and one of the most common ways in which people become seriously disabled. Strokes claim the lives of more than 150,000 Americans a year.

Despite the prevalence and impact of strokes, most medical students receive little or no training in stroke risk and prevention in their first year of study. It's only later, when their studies become more specialized, that some will study strokes in depth.

However, most physicians, regardless of their specialty, have opportunities to provide stroke-related care to their patients. New risk-assessment methodologies and intervention strategies have made comprehensive stroke education even more important.

Sue Billings-Gagliardi, StrokeSTOP director and professor of cell biology and neurology at the UMass Medical School, thought there was a need to teach about stroke in the first-year neuroscience curriculum.

"Before we created StrokeSTOP," she notes, "stroke was addressed differently with first-year students. The focus was not on prevention. We wanted to reduce the chance of stroke by teaching our students about identifying and modifying patients' risk factors as well as about new post-stroke interventions that could make a difference in how stroke patients fare."

The project started with written materials, but student feedback made it clear that the stroke curriculum would make an ideal interactive Web-based tool. With the support of the American Stroke Association, other medical school faculty, and the school's technology department, StrokeSTOP was born.

The result is a set of modules focusing on the blood supply of brain structures, stroke pathology, risk assessment, prevention, diagnosis, and after-care. The modules consist of instructional text, radiographs and scans, diagrams, case studies, self-tests, and patient videos. All of the material is interactive. Students are asked to evaluate risk factors and identify affected parts of a stroke victim's brain. Six modules are online now; eventually there will be 11 complete modules.

Says Lyn Riza, the project's multimedia director based in Information Services, "We wanted to develop a clinical approach to the subject, where students would work with real patient cases. We made sure to include a 'sandbox area' where students could interact with the material."

Recognizing that students learn in different ways, the team developed multiple opportunities to learn. The architecture is student-driven. Riza points out that students worked on the project as well, doing usability testing that led to a number of improvements and even working as videographers.

Illustrated by Allison Cusato

Student James Bath was in the first class to receive the Web-based stroke curriculum and gives it high marks. "The language is very easy to understand," he says. "As first years, we had a very limited medical vocabulary, and the site was careful not to talk over our heads. The animation and pictures are especially helpful when learning routes of blood flow and locations of critical structures in the brain—much more helpful than standard diagrams found in textbooks."

New to the project is the Stroke Risk Detective, an interactive video case bank created with Macromedia Inc.'s Flash Web development application. Using the detective tool, students work with excerpts from patient videos to study risk factors and determine counseling strategies that will likely generate the best possible result for the patient. Students determine what risk factors to address, and StrokeSTOP delivers the patient response.

"In a clinical setting, physicians have to make choices, to prioritize the management of multiple risk factors in a patient," Billings-Gagliardi says. "So one of the goals of StrokeSTOP is to give students experience working with real patient situations, where there may be a lot of different risk factors and they have to determine what makes sense for each patient."

At the end of the exercise, students can view the actual physician's decisions and compare them to their own. Exposure to the counseling experience gives first-year students additional opportunities to develop their patient interviewing skills.

UMass faculty use StrokeSTOP in class and assign it for outside study. "Learning the program was not a requirement per se, but was the best means of learning about stroke," Bath notes.

He especially appreciated the program's flexibility. "The program can be as easy or as in-depth as one needs it to be, depending on your goals," he says. "For students, it not only provides an excellent overview of stroke and its causes, it provides many learning tools to test our knowledge throughout the course."

For more information, visit ***www.strokeassociation.org*** or ***www.umassmed.edu/strokestop.***

Harvard Med School has Network Traffic Cop

Like most professional schools, Harvard Medical School's relationships extend far beyond its ivy-covered buildings. With hundreds of medical, dental, and doctoral students, and 15,000 faculty, medical residents, and fellows spread across 18 affiliated hospitals and institutions, Harvard has a vested interest in maintaining a working network that links all of its affiliates.

Harvard's eCommons Web portal is the medical school's gateway and provides access to such services as the digital library and e-curriculum resources. To protect the portal, HMS already had firewalls in place. However, there was no solution in place to prevent a halt in service should a firewall fail. Determined to keep the portal running with no downtime, the school's technology administrators decided to install high-availability software. The product they chose, Rainfinity Inc.'s RainWall, is designed to enhance security and provide protection from single points of failure.

The high-availability software resides on the same gateway as the firewall and virtual private network software and detects failures in both hardware and software components, including itself. The software shifts traffic from failed firewalls and gateways to functional ones, without disrupting connections. Load-balancing features shift the traffic among all the nodes in a cluster, maximizing resources even when all components are working properly. This ensures not only that the system will work without fail, but also that the software makes a constant contribution to the efficiency of the network. "It's inline, online, and serving a secondary purpose even when everything is up and running," says Joe Bruno, HMS associate dean for information technology and chief information officer.

Because medicine is in business around the clock, HMS can't afford downtime. "We can't let the business of science be interrupted," says Bruno.

With RainWall, HMS can perform hardware upgrades and operating system maintenance without losing system availability or sacrificing throughput performance. Furthermore, because RainWall is used in an active/active standby configuration, HMS can take advantage of previously underused hardware as well as current hardware investments.

For more information, visit ***www.rainfinity.com.***

Illustrated by Jeff Langkau

Redesigning Engineering with the Studio Method

Harvey Mudd College, an elite undergraduate college with an emphasis on engineering, mathematics, and science, has instituted a studio method approach in its introductory engineering curriculum. The first engineering course, called E4—engineering design—was transformed last year into a project-based course in which students work in small groups to design engineering solutions, analyze examples of good engineering, and learn the fundamentals of engineering design.

Harvey Mudd's approach draws on the methodology long used in the fine arts and architecture fields. Within the hands-on approach of the studio method, students work in small groups, mentored by teachers who move about the room like artistic masters looking over students' shoulders.

Students learn from one another as they work through complex, open-ended projects. Something unique about the use of the studio method in this case is that the students are first- and second-year undergraduates with little or no background in engineering.

Their first exposure to engineering concepts and design comes in the form of "mini-lectures" and an opportunity to develop solutions on their own.

"The idea was that rather than us telling them what to do, we would give them an objective and let them work with it," says Patrick Little, associate professor of engineering management. "This emulates real-world scenarios and allows them to develop an understanding of research design methodology."

Because there are no lectures in the new course configuration, students are expected to ask questions if they have them. Little, who co-teaches the course with associate professor Mary Cardenas, says, "We've moved to a series of 'just-in-time mini-lectures' that allow us to intervene when appropriate. It's interesting that after a while, students become confident and engrossed in their projects enough to wave us away if they're in the middle of something they don't want to interrupt." The mini-lectures cover such topics as conflict management and project management tools. Group discussions focus on overcoming a design problem several of the groups encountered; ethics is also part of the ongoing discussion.

The course consists of two short assignments and a lengthy major project that consumes half of the semester. The shorter assignments last for one to three weeks and incorporate learning functional analysis skills as well as writing and basic research skills. In a recent semester, students were given a deserted island scenario. Stranded with only a box of flares and assorted debris, they were asked to build a working clock using only the available materials. For another assignment, students were given an object to deconstruct. None of the items were expensive, but all of them, from an Etch-a-Sketch to a disposable camera, represented design innovations. In the process of cataloguing the parts and determining their functions, students learned engineering fundamentals, a language for design, and an appreciation for good (and bad) design.

For the half-semester major project, each student team worked with an actual client on a real-life project. Students collaborated with the client through idea and design iterations, culminating in a final report to the client that documented the process and outcome of the team's work. Some students worked with the Beckman Laser Institute to develop an improved medical device, a tool for transillumination of nasal sinuses. Others helped a local disabled adolescent by developing a "pantsing" machine, a tool that assists him in putting on his pants.

Inherently, everything about the studio method is different from a traditional lecture course. Even the physical space of the studio, Little notes, should be different. "It shouldn't look like a classroom or a computer lab," he says. Faculty members have been working with the students to design work spaces that encourage creativity and collaboration, asking students to take brightly colored decorations and organize their own spaces. Some students used the materials to improve the room's acoustics, and others sought to create more privacy or a sense of individuality for their teams.

Because students come to this course with no previous exposure to the studio method, some of them have a hard time adjusting. Little and Cardenas have been fine-tuning the course based on student feedback, reducing the number of course assignments from four to three, selecting exercises that can be completed within the time constraints of a semester, and providing feedback to students throughout the semester on their performance. Says Little, "Based on student feedback, we've revised the grading procedures somewhat. Students were anticipating lower grades than they ultimately received because the scored materials, which were only part of their grade, reflected lower results than they finally received at the end of the semester. The studio method necessitates a different approach to grading, and we have to make sure students understand that."

For more information, contact ***Patrick Little*** *at* ***Patrick_Little@HMC.edu.***

Photograph by Jim Harrison

Web-Based Audio Eases Elementary Chinese

By Kylie Hsu

Since the late 1990s, interest in learning Chinese in the United States has increased rapidly. This can be seen in the increased enrollment in Chinese language classes in four-year colleges nationwide. A recent study of 951 institutions of higher education showed the number of students enrolled in Chinese language classes increased 7.7 percent between 1996 and 1998, from 12,542 students to 13,592 students.

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Click the following links to listen to audio in WAV or MP3 file.
The former has higher quality sound but takes longer to open/save.
WAV: Music, Chinese Recitation, English Recitation
MP3: Music, Chinese Recitation, English Recitation

In light of such growth, it is important for universities to provide effective language learning material to new students of Chinese. In particular, it is essential that students of elementary Chinese acquire good listening skills. This is usually done through audio exercises and listening practices, with the instructor and fellow students in the classroom. However, because of the limited amount of available class time, students often rely heavily on independent practice outside the classroom to hone their listening skills.

Some students find conversational partners, but others listen to audiotapes at a language lab or at home. However, the sound quality of such tapes often degrades over time, and students often find it time-consuming and frustrating to have to fast-forward and rewind tapes several times before they can locate a specific exercise. Others may not find it feasible to go to the language lab because of a long commute or a scheduling conflict.

With recent advances in computer and Web technology, however, audio exercises can be recorded and saved as audio files on a designated Web server. Language students can then access the files online on their own time via workstations on a network.

In the fall of 2000, I recorded selected exercises from Practical Chinese Reader (PCR), which has been the most widely used textbook of Chinese language for the past two decades, using the digital audio recorder of a program called Sound Blaster AWE64 by Creative Technology Inc. This program can also edit audio files, but I found another program—Digital Audio Editor from GoldWave Inc.—to be more user-friendly. Because the audio files were recorded in WAV format, they needed to be compressed so that they would occupy much less memory space.

To do this, I converted the WAV files to MP3 compressed files using software called MP3&WAV Converter, a shareware program available at www.mp3convertors.com. Through trial and error, I obtained the best results by setting the bit rate at 56 kilobits/sec and the mode at 16 KHz in stereo.

Using this recording, editing, and compression process, I created 21 exercises and saved each as an MP3 audio file. The exercises are located at www.calstatela.edu/faculty/khsu2/audio.html. They are each hyperlinked to a corresponding audio file that has also been uploaded to the Web server. Because a digital audio player is required to listen to the exercises, I also included hyperlinks to download Winamp and RealNetworks Inc.'s RealPlayer, two widely used digital audio players.

The development of the PCR audio files proved useful. While the language lab was closed for renovation, students could practice listening by accessing the audio files from a computer at home or on campus at any time. Students commented that the sound quality of the Web-based exercises was better than the audiotapes at the lab. Furthermore, they could scroll through the files to advance, back up, or locate a point in a given exercise. They could also swiftly repeat each exercise without having to wait for a tape to rewind.

In the winter of 2001, I used the same recording, editing, and compression process to create Chinese poetry audio files in both WAV and MP3 formats. They are located on the Internet at www.calstatela.edu/faculty/khsu2/poetry2.html.

The timely development of the poetry audio files benefited several students who participated in a poetry recitation contest in the spring of 2001. By listening to online poetry recitation, they were able to improve their pronunciation, intonation, and expression.

The dynamic multimedia environment was engaging, and it sustained active learning. Student comments included the following: "On your Web site, I enjoyed listening to the poetry audio clips that you included, and these helped me understand the proper tone and inflections of Chinese poetry performance." Or, "These poems were wonderful. Being able to hear the poem read back to you is definitely a great feature."

Web technology has created countless possibilities for online instruction and learning. Web-based audio files have become a useful resource for language learning and acquisition of listening skills beyond classroom walls.

The Chinese-language audio files were a benefit to students who would otherwise not be able to practice listening because of time constraints or distance from the classroom and language lab. The ease of use, the speed of operation, the quality of sound, and the multimedia environment all contributed to the enhancement of language learning.

Kylie Hsu is associate director of the Chinese Studies Center at California State University, Los Angeles. She can be reached at ***kyliehsu@msn.com.***

Giving Exams in an Online Chat Room

By Janet K.M. Marta

I've lately become aware that my expectations are often negative when confronted with something new. I'm not a negative person usually, but this was certainly the case when I confronted the idea of teaching my International Business course online. I committed to trying it once, but I admit I didn't have high hopes. After all, I confided to friends, one of the rewards of teaching is being there to actually see the light go on in a student's eyes.

We are now plunging into our fourth semester. And although online teaching has some drawbacks, it also has advantages over the classroom. One of these advantages is that you get to know your students and their educational needs much better because they communicate far more readily in threaded discussions than they do in the classroom. My negative expectations that online teaching lacked a social element failed to account for the social pressure that silences so many students in class. And I've discovered another unexpected reward in a chat room: I can use a kind of Socratic question-and-answer method that I achieve all too rarely in a classroom.

The final assessment in my online class takes place one-on-one, in a chat room. About a week before the first exam, I post times when I'll be available, and students sign up on a first come, first served basis for half-hour time slots. In the same message, I include 10 to 12 potential questions. These are big, theoretical questions, such as assessing the pros and cons of China's entry into the World Trade Organization.

I tell students they have the option of skipping one question, but that they should prepare to answer all the others. I stress that they should marshal their main points, because the half-hour will go more quickly than they think, but not to prepare entire answers word-for-word, because the assessment will be a dialogue. I also tell them to have a copy of the questions on hand when they come to the chat room, so I can refer to them by number.

When the big moment arrives, I try to get into the chat room a minute or two early and type in a greeting: "Hi, Daniel. I'm ready when you are." When they get in and say they're ready, I ask them to start with number 3, please. As they get started typing, I post another message, asking them to hit "enter" every two or three sentences, so I can ask questions or redirect.

Then, as they post, I can choose to wait until their meaning is clear, push for further clarity, or redirect if they're off track. "In what specific situations would that be true?" "What do you mean by cultural barriers?" "Can you give me an example?" After about 27 minutes of this torture, I post a message to the effect that they're off the hot seat and do they have any questions before we log off? Many are amazed that the time has gone so quickly, and they often write that it wasn't nearly as bad as they had anticipated.

An online chat room final exam has its

Train Student Technologists—and Get Tech Support

The ever-growing demand for technology services on college campuses has strained budgets to the breaking point. Limited resources collide with increasing student enrollments. Busy information technology staff members struggle to address the needs of tech-savvy faculty clamoring for tools and training. Trained technology specialists are hard to find and expensive to hire.

One solution that some campuses have used: Hire students to supplement the IT staff. At the University of Wisconsin, Milwaukee, they've taken this one step further, developing a department composed solely of student employees and student managers. The department, Student Technology Services, received an Educause Exemplary Practices Award in 2001.

UWM's work-based learning environment provides on-the-job training while performing a desperately needed campus service. The Student Technology Services group employs about 300 students who deliver technology services in more than 20 functional areas, including lab, classroom, and desk support, help desk, network services, training, and audiovisual services. These functional work groups parallel associated groups of full-time staff.

Staffed and managed entirely by students, the STS program develops both technology and workplace skills. The organization treats the student employees as empowered decision-makers, service providers, managers, and paraprofessionals. Interestingly, STS draws its student staff from all over campus, with more than half of its hires coming from majors not usually associated with technology.

Mentors drawn from the full-time IT

pitfalls, of course. Half an hour isn't a very long time to evaluate a student's understanding of a range of theoretical material. My experience, however, is that I can cover about three questions in that amount of time, which is usually the number I grade ("choose three out of four") on a written final. We get to the nub of the matter more quickly in a chat room—no time for fluff.

One problem is that the students are more nervous than they are for a traditional written final, but test anxiety is present in any evaluation. This type of testing may favor those who can think on their feet. For the instructor, a problem is that the fabric of your chair imprints itself on your derrière if you do a number of these in a row.

Many teachers ask whether the half-hour I spend with each student doesn't become an overwhelming time requirement. My online class has 25 students, maximum, each semester, so I spend 12-and-a-half hours on the final. This is comparable to the time I spend giving a traditional exam, when you factor in the time to proctor and grade it. Even if it does take an hour or two more of my time, it is more than worth it to me because the work is more interesting.

Exams are a bunch of dead documents on my desk; as I grade them I often think that a student knew more than they wrote, or wish they hadn't gotten off track. A chat room final, on the other hand, is an ongoing personal interaction, during which I can get answers to those kinds of questions. The situation also keeps my brain from switching into neutral.

Perhaps the most interesting thing I'm learning as I do more of these is that some students are energized by a "rapid-fire patter" approach. They post a sentence, or even a phrase, and jump right in with both feet when I redirect or ask for examples or clarification. But other students need to express an entire idea first, or they become confused and nervous. This is now the main thing I watch for when I start the exam and something that becomes clearer with practice.

The worst problem I've run into with this method is technical trouble, such as when a student gets kicked out of the chat room in the middle of a session for some mysterious reason. I've had to deal with these (about one or two each term) individually, but the problem is as broad as online education. One simply has to deal with occasional technical glitches.

In general, I'm quite pleased with my experience of giving online chat room exams. An educational medium about which I was doubtful has forced me to do something that is easy to neglect in a traditional setting—use multiple methods of evaluation.

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staff advise student supervisors, although students have an incredible amount of autonomy. According to Beth Schaeffer, Student Technology Services external program manager, student human resource managers do their own hiring and personnel management. They manage their own budgets and make more decisions. Schaeffer and her co-manager, Dean Holschbach, manage internal and external issues and act as overall supervisors for the STS group.

The benefits to the university are obvious and quantifiable. UWM estimates that it has added 85 full-time equivalent positions to its technology support staff at 40 percent of the cost of a permanent, nonstudent staff. Across the campus, service levels and user satisfaction have improved. Full-time IT staff members are free to focus on complex priorities, and the university has actually been able to add technology services.

In the three years since its inception, STS has grown into a successful venture that last year spun itself off into comparable programs at Milwaukee public schools and the Milwaukee Area Technical College. Says Schaeffer, "We worked with the public schools and MATC to help them develop their own STS programs. Our STS staff has worked with several high schools that have Cisco Network Academy classes, and we have been helping with the training and development of student staff." They've also been developing a database that will track student experience and participation in the STS program from high school on up, so that incoming college students can build on their past successes and find appropriate-level placements at MATC or UWM.

The local business community and the state government collaborate with STS through the Business Partners program, providing additional opportunities for students to develop professional experience during the summer. These summer assignments benefit both students and employers.

Says Schaeffer, "At the end of the summer, the employer writes an evaluation that the student and UWM can use to develop a training program to fill in any gaps in the student's skill base. At the same time, these employers build relationships with future valuable employees."

For more information, contact ***Beth Schaeffer*** *at* ***beths@uwm.edu.***

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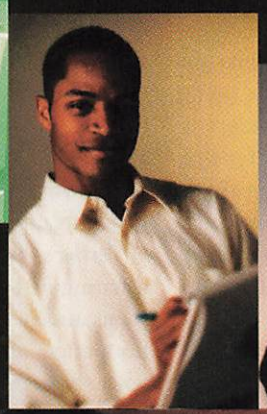

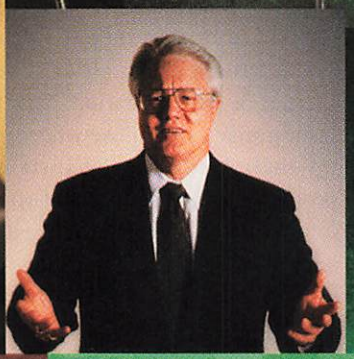

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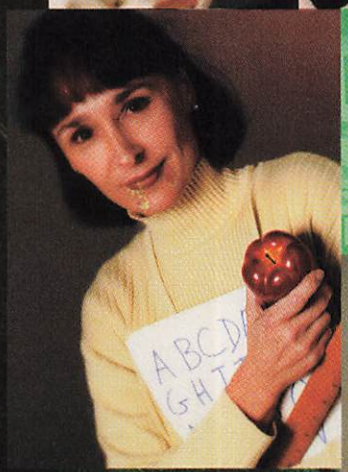

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101communications

Luminis: Unifying the Digital Campus

When it comes to campuswide software programs and applications, can't they all just get along? Usually not, because the various systems in place aren't integrated in such a way that they can "talk" to one another and share data. However, Campus Pipeline Inc. promises to unify systems with its new Luminis product family, which consists of a Web platform, a content management suite, and a systems integration suite.

Campus Pipeline is well-known for its Web Platform 3.1 product as well as its campus Web portal technology. Luminis is a major new venture for the company and greatly expands its services and the reach of its technology innovations. The new product, "an operating system for the campus," is the culmination of efforts at Campus Pipeline and partnerships with industry leaders and top-tier academic institutions.

Campus Pipeline has worked with more than 100 campus users of its other products and three core consulting universities—the University of Miami, Drexel University, and Pepperdine University—to develop the new platform and integration tools. In addition, the company has partnered with Sun Microsystems Inc., whose Open Net Environment strategy now brings standards-based software architecture to bear on higher education.

The collaboration also includes building Sun's iPlanet suite of communication and scheduling products into the Luminis family. Other collaborators are Documentum Inc., Dell Computer Corp., SCT, and the Java in Administration Special Interest Group.

The Luminis product line consists of three components: Luminis Platform II, a set of tools and applications for systems administration, communication, portals, and data and user management that enables institutions to access and manipulate data in a Web environment; Luminis Integration Suite 3.0, which integrates campus systems, applications, and databases into a working whole; and Luminis Content Management Suite 2.0, software for creating, managing, and delivering Web content. Together, the three tools constitute what Campus Pipeline is calling a unified digital campus.

Platform II does not replace Campus Pipeline's existing Web Platform 3.1. That plug-and-play tool will remain in the company's stable of products. However, Platform II's more modular, complex system affords greater flexibility and freedom than 3.1, as well as a number of advancements such as single sign-on and advanced portal features.

Institutions able to commit more expertise and resources to their campus systems will find Platform II a more robust choice than 3.1. The new platform offers common software services that ensure security, scalability, stability, user management, and system administration.

The Luminis Integration Suite brings together disparate components system-wide, permitting the sharing of data and creating a flexible online environment. Also, Integration Suite 3.0 unifies new and legacy systems, minimizing the need to jettison older systems that don't fit into the new plan. Luminis tools do the heavy lifting, easing the burden on harried information technology staff and conserving resources for other projects.

Designed to work with old, current, and future systems, the open-system technology enables institutions to build the system as needed. Campus Pipeline also sells integration adapters that integrate third-party systems into the Luminis system. Both prepackaged and customized adapters are available.

Certainly, one of the most persistent headaches for faculty and IT staffers is content management. In academic departments, staff groups, and student organizations, individuals develop materials that must somehow end up online in something akin to a consistent look and feel. Those who are generating the content are usually not technology experts, and the experts are too busy to help.

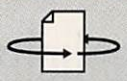
The Luminis Content Management Suite promises to simplify the process of creating, approving, and distributing

Content Management Life Cycle

Content Creation

Administrator, faculty, or staff create a content document for a campus audience.

Input to Content Management Infrastructure



Once the document is created, it is sent into the content management system using customizable templates that feature predefined document structure, layout, design, and presentation for various kinds of Web-based information.

Content Review Process

Content is sent out to all involved constituents for review. Automated workflow allows content creators and approvers to monitor the movement of content from creation through delivery.

Approval

Upon receiving and implementing input from all involved constituents, the content owner is ready to send out fully approved content.

Distribution/Notification Management

The content owner assigns access to and delivery of content based on user attributes such as major, role, class, or status. The content owner can also send personally relevant messages about the new content to appropriate audiences on an as-needed basis.

Ongoing

The content owner can ensure that content is always current by assigning retirement dates to each item. He or she can also use user-friendly forms to update or edit content.

Illustrated by Allison Cusato

Web content by permitting users with no technical expertise to develop and distribute original content. Creators rely on a set of templates and forms that ensure the final product will maintain the designated look and feel.

The Content Management Suite routes material into the content management system for approval and distribution. Role designation and automatic retirement functions ensure that content creators have control over how long the content stays up and who can receive it. The process is designed to minimize the involvement of technical staff.

The Integration Suite and the Content Management Suite are each available in different versions. A Starter Edition of the Content Management Suite provides an integrated server with content and workflow templates as well as search and cataloguing features for publishing on the campus intranet. The Master Edition adds features such as customization tools and automated auditing and reporting processes. A syndication tool speeds download time for users by synchronizing servers across disparate campuses and server farms. The Enterprise Edition extends full content management capabilities beyond the intranet to the campus' external, public Web sites.

The Starter Edition of the Integration Suite provides just one adapter to integrate one third-party student information system into the digital campus. The Enterprise Edition supports unlimited connections.

Potential users should also be aware that Luminis is being sold both as individual components and prepackaged bundles, which are roughly equivalent to the Starter Editions and Enterprise Editions, respectively.

The Luminis Integration Suite is available now; the full line of Luminis products will be available this spring.

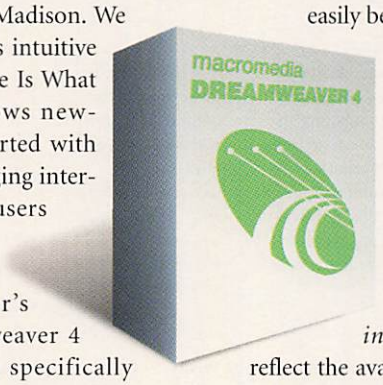
For more information, visit ***www.campuspipeline.com*** *or call (888) 682-7473.*

Web Design Tool Packs Simplicity and Power

By Alan Foley

If you are looking for a quick and easy route to building a robust Web site, Macromedia Inc.'s Dreamweaver 4 is a top choice, delivering a powerful set of tools for both emerging and expert Web developers.

I have taught technology classes to faculty, colleagues, and students at the University of Wisconsin, Madison. We found that Dreamweaver's intuitive WYSIWYG (What You See Is What You Get) interface allows newcomers to quickly get started with Web design while challenging intermediate and advanced users with new tricks and a functionality that scales to meet a developer's growing needs. Dreamweaver 4 also offers features that specifically benefit educators, such as extensive support for accessibility, a wealth of online learning templates, and support for learning management systems.



It seems that all departments at U.W. Madison have sent staff to my classes to learn elementary Web design. Dreamweaver allows users unfamiliar with Web design to create a Web page without knowing HTML. Anyone who is familiar with word processing tools will find that the Dreamweaver interface offers a familiar, intuitive environment. As users enter text on the page, it appears in the document window as it would in a Web browser, and Dreamweaver automatically generates the HTML code in the background.

Novices can develop Web content easily because Dreamweaver places the most useful formatting features on a single palette called the property inspector. As users select different elements of a page to work on, the *property inspector* changes to reflect the available options. With this single palette, users are able to format text, create links to other pages, insert images, and quickly edit the underlying HTML code.

One of the features that sets Dreamweaver apart from competitors is the site files window. This window helps users understand where to save files and how to publish them to their campus Web server by dragging and dropping them from one side of the window to another.

Dreamweaver provides incomparable help and reference tools, such as well-written tutorials, directly in the application. In addition, Macromedia's free TrainingCafe.com Web site offers novices a step-by-step template to build a course Web site in Dreamweaver. In a couple of hours, faculty can have a fully functioning course Web site including syllabus, materials, and chat room.

A unique feature of Dreamweaver is a full electronic version of the reference section of O'Reilly and Associates Inc.'s *Dynamic HTML: The Definitive Reference on HTML, JavaScript and Cascading Style Sheets.* These popular reference manuals can be accessed within Dreamweaver for explanations, examples, and specifications. These tools help novice designers quickly understand and employ the more powerful features Dreamweaver has to offer.

The majority of professional Web designers choose Dreamweaver 4. It offers unparalleled support for editing HTML, cascading style sheets (CSS), and JavaScript. Changes to HTML may be done by hand from either the document window or the *property inspector.* When

working with CSS, users can quickly attach external style sheets or add individual styles. Users can then preview the results in a Web browser by pressing a single button, making editing CSS much more reliable.

Dreamweaver also provides stable tools for sites created and maintained by more than one person. These tools are especially useful in groups that include users with a variety of skill levels and experience. Templates and library objects allow advanced users to create a common look and feel for a site and limit the areas to which other users may make changes. Templates and library objects also allow advanced users to revise a single template and make changes to every page on a site that uses that template. This can dramatically simplify maintenance of a Web site.

Dreamweaver 4 brings the benefits of vector graphics and text to the HTML editing environment by adding modified Macromedia Flash tools. These additions let you create Flash Text and Flash Buttons directly within Dreamweaver.

Dreamweaver 4 also offers a range of specialized features and tools, including support for accessibility. Policies ensuring access to Web content for people with disabilities have become increasingly common for Web sites in educational settings. Dreamweaver significantly simplifies the process of creating accessible sites. The software not only writes clean, simple, and standard HTML code, but also makes it easy to add markups commonly used by assistive technologies. These include alternative text for images and image maps, headers for data tables, and CSS information.

Dreamweaver also offers designers a number of solutions for accessibility through its extensions. These are free, downloadable add-ons to Dreamweaver that are available from the Macromedia Web site (www.macromedia.com/exchange/dreamweaver). Perhaps the most notable of those tools is the 508 Accessibility Suite from UsableNet Inc. This extension automatically checks pages or entire sites for accessibility problems, making it much easier for novices and experienced designers alike to understand accessibility issues with their sites.

Faculty who develop distance learning courses find that Dreamweaver is an excellent tool for creating online learning content. With its integration with other Macromedia products such as Macromedia Flash and Fireworks, Dreamweaver makes it easy for educators to create engaging and effective multimedia lessons. Dreamweaver also offers a powerful extension for creating online learning objects. CourseBuilder is one of the many free extensions for Dreamweaver. It allows designers to create assessment forms and integrate them into a learning management system.

Whether you are new to Web design or a professional designer, Macromedia Dreamweaver 4 is a good choice. Dreamweaver offers a simple, easy-to-use interface with a powerful set of tools and features to help faculty and students create engaging Web sites. Dreamweaver 4 delivers productivity enhancements for high-end developers and lowers the barrier to entry for novices.

Alan Foley, *Ph.D., is joining the faculty at North Carolina State University as an assistant professor of educational technology.*

Surfing 101: Online Support for Reading, Writing, and Research

Once described as the "world's greatest library, only all the books are on the floor," the World Wide Web is perhaps the best academic resource in the world if you know how to navigate its vast holdings. No one has enough time to sift through its many research-appropriate sites, but we've identified some that we think are among the best places to begin an academic project.

Research Relief

Faster than a trip to the local public library is a visit to the Internet Public Library ***(www.ipl.org)***. A service of the University of Michigan School of Information, the library provides online access to more than 18,000 full-text documents in a variety of disciplines and offers tips on conducting Web searches. An Especially for Librarians section presents resources, support, and fun facts for library professionals.

Another good general resource is Academic Info ***(www.academicinfo.net)***, an independent Internet subject directory that aims to be the "premier educational gateway to online college and research-level Internet resources." Students and academics will appreciate its gateways, current events links, and student center.

The Argus Clearinghouse ***(home.sprintmail.com/~debflanagan/argus.html)*** is a virtual academic library organized into categories that closely parallel those found at a typical university: arts and humanities, education, social sciences, and science and mathematics are included, along with a few additional topics such as recreation, places and people, and social issues.

The Biographical Dictionary ***(www.s9.com/biography)***, from S9 Technologies, is a terrific starting point for students or academics researching famous lives. The database includes more than 28,000 entries searchable by name, date, or keyword. The keyword search comes in handy when you have a topic in mind but not a specific subject.

A more specialized set of biographies can be found in the Presidents of the United States section of the Internet Public Library site. It offers in-depth material on the lives and speeches, including audio and video files, of

the 43 presidents *(www.ipl.org/ref/POTUS)*.

To start your search on writers or works of literature, visit the Literary Calendar portal *(english.yasuda-u.ac.jp/lc/links.php)*, which has 150 links to American literature Web sites alone. Bartleby.com: Great Books Online *(bartleby.com)* offers hundreds of full-text versions of classic works of reference, verse, fiction, and nonfiction, along with quotations, a dictionary, and a thesaurus. Art and Culture *(www.artandculture.com)* links visitors to resources in the fine and performing arts and features a unique search engine that helps users discover links between artists and various movements.

There are also thousands of useful science sites on the Web. Looking for articles? Go to HighWire Press *(highwire.stanford.edu)*, a service of Stanford University Libraries and one of the two largest free full-text science archives on the Web. The Life Science Dictionary *(biotech.icmb.utexas.edu/pages/dictionary.html)*, developed at the University of Texas, features more than 8,300 terms in biochemistry, biotechnology, botany, cell biology, genetics, and other fields.

Need still more authoritative guidance? Entrust yourself to the editors of *Scientific American*, who offer their services through their Ask the Experts page *(www.sciam.com/askexpert)*. Find out why most people are right-handed and what that weird sound is when your knuckles crack—or formulate your own question about astronomy, medicine, biology, or mathematics. From here you can also link to Scientific American's favorite science sites, including an interactive periodic table of the elements from scientists at Los Alamos National Laboratory *(pearl1.lanl.gov/periodic/default.htm)*.

The National Academy of Engineering celebrates the greatest engineering achievements of the 20th century, from the highway to the information superhighway, on its site *(www.greatachievements.org)*. This could be the start of a great term paper assignment.

Interested in a slightly older technology? Try the History of Plumbing site *(www.theplumber.com/H_index.html)*. Need to measure something or convert barrels to gallons? Check out the Dictionary of Units site *(www.ex.ac.uk/cimt/dictunit/dictunit.htm)*, which lists most of the units of measurement in use around the world today (and a few of historical interest), together with the appropriate conversion factors needed to change them into other units.

The World Wide Web is perhaps the best academic resource in the world if you know how to navigate its vast holdings.

Tools for Teachers

Need a grant? You can get tips, learn techniques, and purchase books on grant writing from a Web site devoted to helping grant seekers *(granthelp.clarityconnect.com)*. Looking for an audio clip to incorporate into your classroom lecture or Web site? Go to the Speech and Transcript Center *(gwis2.circ.gwu.edu/~gprice/speech.htm)* for a large collection of captured sound bites and transcripts.

Information from the Spanish-speaking world is available on Mundo Latino's Web portal *(www.mundolatino.org/index.shtml)*, which features a list of links to Spanish-language sites organized by nationality (including U.S. Web sites in Spanish).

Those struggling with high-tech terminology may find Webopedia useful. Webopedia *(www.webopedia.com)*, an online encyclopedia of all things related to computers and the Internet, will help you distinguish bits from bytes and thin clients from fat clients.

Another kind of language is covered on the College Slang Page *(www.intranet.csupomona.edu/~jasanders/slang)*. This site will help you translate what your students and children are actually saying. But are you sure you really want to know?

Writing and Presentation Help

The University of Kansas Department of Communication Studies has created two nifty research sites—a guide to conducting social scientific research and a decision tree that helps researchers determine which statistical techniques to use for a project. You can find the Virtual Research Assistant at *www.ukans.edu/cwis/units/coms2/vra/door.html* and the Virtual Statistical Assistant at *www.ukans.edu/cwis/units/coms2/vsa/index.htm*.

Need a research topic? Visit *www.researchpaper.com*, which offers loads of ideas and advice on how to organize your written material. And you may want to check out the Internet Public Library's reference section *(www.ipl.org/ref/QUE/FARQ/netciteFARQ.html)* for a guide to citing online sources. Although there is no definitive style, the library provides links to authorities on the subject.

And to put the final polish on your paper, take either the high-tech approach with Wired Style *(hotwired.lycos.com/hardwired/wiredstyle/toc/index.html)*, the *Wired* magazine editors' guide to Internet style, or the traditional route with the first edition of William Strunk's *Elements of Style*, available online at *www.bartleby.com/141*.

Illustrated by Allison Cusato

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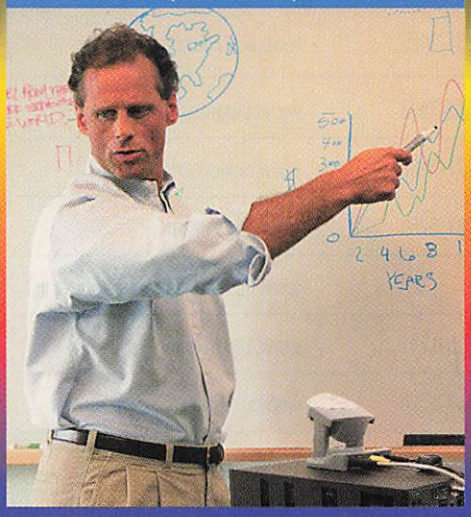

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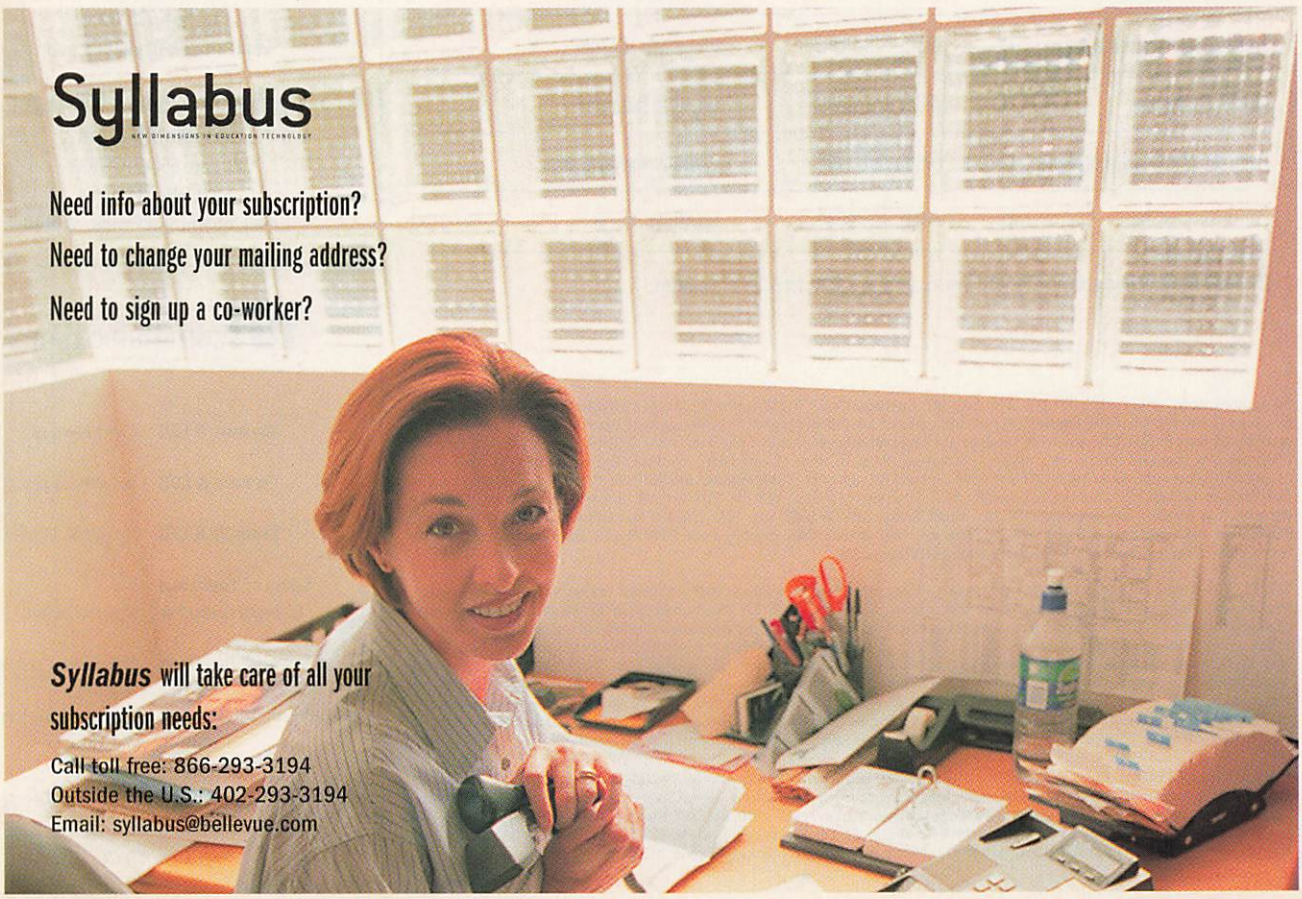

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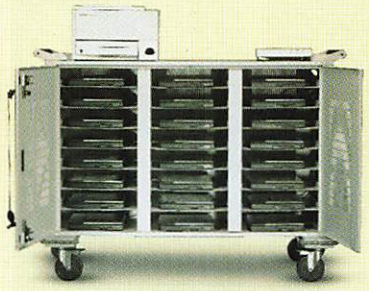

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